EXHIBIT 1

UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

HEADWATER RESEARCH LLC, *Plaintiff and Counterclaim-Defendant*, v. T-MOBILE US, INC., T-MOBILE USA, INC., and SPRINT CORP., *Defendants and Counterclaimant-Plaintiffs*.	Case No. 2:23-CV-00379-JRG-RSP **(LEAD CASE)** **JURY TRIAL DEMANDED**
HEADWATER RESEARCH LLC, *Plaintiff and Counterclaim-Defendant*, v. T-MOBILE US, INC., T-MOBILE USA, INC., and SPRINT CORP., *Defendants and Counterclaimant-Plaintiffs*.	Case No. 2:23-CV-00377-JRG-RSP (MEMBER CASE) **JURY TRIAL DEMANDED**

PLAINTIFF HEADWATER RESEARCH LLC'S DISCLOSURE OF ASSERTED CLAIMS AND INFRINGEMENT CONTENTIONS

Pursuant to P.R. 3-1 and P.R. 3-2, patent owner Headwater Research LLC ("Headwater") hereby provides its disclosure of asserted claims and infringement contentions and its accompanying document production. This disclosure is based on the information available to Headwater as of the date of this disclosure, before Headwater has received any discovery on the design or operation of the defendants' products. Headwater reserves the right to amend this disclosure to the full extent permitted under the court's rules and orders.

P.R. 3-1: DISCLOSURE OF ASSERTED CLAIMS AND INFRINGEMENT CONTENTIONS

P.R. 3-1(A): ASSERTED CLAIMS

Headwater asserts that defendants T-Mobile US, Inc., T-Mobile USA, Inc., and Sprint Corp. (collectively, "T-Mobile") infringe one or more of the following claims, directly, by inducement, by contributory infringement:

U.S. Patent No.	*Asserted Claims*
8,589,541	1-174
8,924,543	1-13, 15-16, 21-23, 28, 30-33, 35-47, 57-66, 68-72, 80, 85-93, 96, 98-99, 112-113, 120-121
9,198,042	1-9, 12-14, 16-18
9,215,613	1-24

Collectively, these four patents are referred to herein as the Asserted Patents, and these claims as the Asserted Claims.

P.R. 3-1(B): ACCUSED INSTRUMENTALITIES OF WHICH HEADWATER IS AWARE

In this section, Headwater provides lists of accused products that Headwater is aware of infringing based upon information presently available to it and its investigation to date. Headwater's infringement claims are not limited to these listed products and specifically extend to all products and apparatuses of T-Mobile similar to the listed products that include the claimed elements. Unless otherwise stated, Headwater's infringement assertions apply to all variations, versions, editions, and applications of each of the listed products.

U.S. PATENT NO. 8,589,541

Headwater accuses the following smartphones, basic phones, tablets, laptops, and hotspot devices sold (including those sold in bundles with data plans) or used by T-Mobile for use with T-Mobile's wireless network services of infringing each of the Asserted Claims of the '541 patent:

Servers, hardware, software, and services leased, owned, supported, and/or operated by T-Mobile comprising T-Mobile's wireless network services functionality.

Phones, tablets, wearables, and devices used, sold, offered for sale, or imported within six years of the filing of the date of the lawsuit comprising Apple software (e.g., iOS, WatchOS, etc.) including but not limited to the following: iPad Air, iPad Mini 2, iPhone 5C, iPhone 5S, iPad Air 2, iPad mini 3, iPhone 6, iPhone 6 Plus, iPad mini 4, iPad Pro, 12.9 in., iPhone 6S, iPhone 6S Plus, iPad Pro, 9.7 in, iPhone 7, iPhone 7 Plus, iPhone SE (1st Gen), iPad Pro, 10.5 in., iPad Pro, 12.9 in. (2nd Gen), Watch Series 3, iPhone 8, iPhone 8 Plus, iPhone X, iPad (6th Gen), Watch Series 4, iPad Pro, 11 in. (1st Gen), iPad Pro, 12.9 in. (3rd Gen), iPhone XR, iPhone XS, iPhone XS Max, iPad (7th Gen), iPad Air (3rd Gen), iPad Mini (5th Gen), iPhone 11, iPhone 11 Pro, iPhone 11 Pro Max, Watch Series 5, iPad (8th Gen), iPad Air (4th Gen), iPad Pro, 11 in. (2nd Gen), Watch Series 6, Watch SE, iPad Pro, 12.9 in. (4th Gen), iPhone 12, iPhone 12 Mini, iPhone 12 Pro, iPhone 12 Pro Max, iPhone SE (2nd Gen), iPad (9th Gen), iPad Mini (6th Gen), iPad Pro, 11 in. (3rd Gen), iPad Pro, 12.9 in. (5th Gen), iPhone 13, iPhone 13 Mini, iPhone 13 Pro, iPhone 13 Pro Max, Watch Series 7, iPad (10th Gen), iPad Air (5th Gen), Watch Series 8, Watch SE (2nd Gen), Watch Series 9, iPad Pro (6th Gen), iPhone 14, iPhone 14 Plus, Watch Ultra, Watch Ultra 2, iPhone 14 Pro, iPhone 14 Pro Max, iPhone SE (3rd Gen), iPhone 15, iPhone 15 Pro, iPhone 15 Plus, and iPhone 15 Pro Max.

Phones, tablets, wearables, and devices used, sold, offered for sale, or imported within six years of the filing of the date of the lawsuit comprising Android software (e.g., Android Operating System Platform) including but not limited to the following: Galaxy A03s, Galaxy A10e, Galaxy A13, Galaxy A13 5G, Galaxy A14 5G, Galaxy A20, Galaxy Core Prime, Galaxy J3 Eclipse, Galaxy Note 10+, Galaxy Note 10+ 5G, Galaxy Note 20 5G, Galaxy Note 5, Galaxy Note 6, Galaxy Note 7, Galaxy Note 8, Galaxy Note 9, Galaxy S10, Galaxy S10 5G, Galaxy S10+, Galaxy S10e, Galaxy S20 FE 5G, Galaxy S20 Ultra 5G, Galaxy S20+ 5G, Galaxy S21 5G, Galaxy S21 FE 5G, Galaxy S21 Ultra 5G, Galaxy S21+ 5G, Galaxy S22, Galaxy S22 Ultra, Galaxy S22+, Galaxy S22+, Galaxy S23, Galaxy S23 Ultra, Galaxy S23+, Galaxy S23 FE, Galaxy S5, Galaxy S6, Galaxy S6, Galaxy S6 edge, Galaxy S6 edge +, Galaxy S7, Galaxy S8, Galaxy S8+, Galaxy S9, Galaxy S9+, Galaxy Z Flip 3 5G, Galaxy Z Fold 3 5G, Galaxy Z Fold 4, Galaxy Z Fold 5, Galaxy Z Flip 4, Galaxy Z Flip 5, Note 10+ 5G, Galaxy Tab 4 (8.0, Galaxy Tab E, Galaxy Tab S, Galaxy Tab S2, Galaxy Tab S6, Galaxy Tab S7+ 5G, Galaxy Tab A, Galaxy Tab A 8.0, Galaxy Tab A 8.4, Galaxy Note 20 Ultra 5G, Galaxy A02s, Galaxy A12, Galaxy A01, Galaxy A21, Galaxy A51, Galaxy S7 edge, Galaxy Note 10, Galaxy S20 5G, Gear S2, On5, Galaxy J7 Star, Galaxy J3 Star, Pixel 3, Pixel 3 XL, Pixel 3a, Pixel 3a XL, pixel 4, Pixel 4 XL, Pixel 5, Pixel 6, Pixel 6 Pro, Pixel 6a, Pixel 7 Pro, Pixel 7, Pixel XL, OnePlus 6T, HTC 10, One M9, Aristo 2 Plus, G Pad F 8.0, G Pad 10.1, G Pad x8.3, G4, G5, G6, G7, G7 ThinQ, G8, G8 ThinQ, K10, K20 V, K20 V, K30,

K40, K7, Stylo 4, Stylo 5, V10, V20, V30, V40 ThinQ, V50 ThinQ 5G, V60 ThinQ 5G, Velvet 5G, Wing 5G, Edge 2022, moto e play (5th Gen), moto e plus (5th Gen), Moto g pure, Moto g stylus 5G (2021), Moto g stylus 5G (2022), moto g6, moto g7 power, REVVL 2, REVVL 2 Plus, Avid Plus, Obsidian, 7 Pro, REVVL 5G, V60 ThinQ 5G Dual Screen, 7T Pro 5G McLaren, Aristo 4+, moto e 6th gen, Nord N200 5G, REVVL V+ 5G, razr 5G, 9 5G, Nord N300 5G, 10T 5G, REVVL 6 PRO 5G, Stylus 5G, 10 Pro 5G, Voix, Nord N20 5G, 30 XE 5G, G400 5G, one 5G ace, 8 5G, REVVLRY, Stylo 6, K51, REVVL 4, X100 5G, moto g 5G (2022), REVVL 6 5G, Voix, Nexus 9, Onetouch Pixi 7, Onetouch Pop 7 LTE, 3T 8-inch, G Pad 5 10.1 FHD, Joy Tab 2, Tab 8 LE, Tab 10 5G, 9 Pro 5G, Nord N10 5G, REVVL 4+, Nord N100, 8T+ 5G, Pixel Watch, V30+

The products in the preceding list, including all variations, editions, and applications of the foregoing, and all products and apparatuses of T-Mobile similar to the foregoing that include the claimed elements are the ’541 Accused Instrumentalities.

U.S. PATENT NO. 8,924,543

Headwater accuses the following smartphones, basic phones, tablets, laptops, and hotspot devices sold (including those sold in bundles with data plans) or used by T-Mobile for use with T-Mobile’s wireless network services of infringing each of the Asserted Claims of the ’543 patent:

Servers, hardware, software, and services leased, owned, supported, and/or operated by T-Mobile comprising T-Mobile’s wireless network services functionality.

Phones, tablets, wearables, and devices used, sold, offered for sale, or imported within six years of the filing of the date of the lawsuit comprising Apple software (e.g., iOS, WatchOS, etc.) including but not limited to the following: iPad Air, iPad Mini 2, iPhone 5C, iPhone 5S, iPad Air 2, iPad mini 3, iPhone 6, iPhone 6 Plus, iPad mini 4, iPad Pro, 12.9 in., iPhone 6S, iPhone 6S Plus, iPad Pro, 9.7 in, iPhone 7, iPhone 7 Plus, iPhone SE (1st Gen), iPad Pro, 10.5 in., iPad Pro, 12.9 in. (2nd Gen), Watch Series 3, iPhone 8, iPhone 8 Plus, iPhone X, iPad (6th Gen), Watch Series 4, iPad Pro, 11 in. (1st Gen), iPad Pro, 12.9 in. (3rd Gen), iPhone XR, iPhone XS, iPhone XS Max, iPad (7th Gen), iPad Air (3rd Gen), iPad Mini (5th Gen), iPhone 11, iPhone 11 Pro, iPhone 11 Pro Max, Watch Series 5, iPad (8th Gen), iPad Air (4th Gen), iPad Pro, 11 in. (2nd Gen), Watch Series 6, Watch SE, iPad Pro, 12.9 in. (4th Gen), iPhone 12, iPhone 12 Mini, iPhone 12 Pro, iPhone 12 Pro Max, iPhone SE (2nd Gen), iPad (9th Gen), iPad Mini (6th Gen), iPad Pro, 11 in. (3rd Gen), iPad Pro, 12.9 in. (5th Gen), iPhone 13, iPhone 13 Mini, iPhone 13 Pro, iPhone 13 Pro Max, Watch Series 7, iPad (10th Gen), iPad Air (5th Gen), Watch Series 8, Watch SE (2nd Gen), Watch Series 9, iPad Pro (6th Gen), iPhone 14, iPhone 14 Plus, Watch Ultra, Watch Ultra 2, iPhone 14 Pro, iPhone 14 Pro Max, iPhone SE (3rd Gen), iPhone 15, iPhone 15 Pro, iPhone 15 Plus, and iPhone 15 Pro Max.

Phones, tablets, wearables, and devices used, sold, offered for sale, or imported within six years of the filing of the date of the lawsuit comprising Android software (e.g., Android Operating

System Platform) including but not limited to the following: Galaxy A03s, Galaxy A10e, Galaxy A13, Galaxy A13 5G, Galaxy A14 5G, Galaxy A20, Galaxy Core Prime, Galaxy J3 Eclipse, Galaxy Note 10+, Galaxy Note 10+ 5G, Galaxy Note 20 5G, Galaxy Note 5, Galaxy Note 6, Galaxy Note 7, Galaxy Note 8, Galaxy Note 9, Galaxy S10, Galaxy S10 5G, Galaxy S10+, Galaxy S10e, Galaxy S20 FE 5G, Galaxy S20 Ultra 5G, Galaxy S20+ 5G, Galaxy S21 5G, Galaxy S21 FE 5G, Galaxy S21 Ultra 5G, Galaxy S21+ 5G, Galaxy S22, Galaxy S22 Ultra, Galaxy S22+, Galaxy S22+, Galaxy S23, Galaxy S23 Ultra, Galaxy S23+, Galaxy S23 FE, Galaxy S5, Galaxy S6, Galaxy S6, Galaxy S6 edge, Galaxy S6 edge +, Galaxy S7, Galaxy S8, Galaxy S8+, Galaxy S9, Galaxy S9+, Galaxy Z Flip 3 5G, Galaxy Z Fold 3 5G, Galaxy Z Fold 4, Galaxy Z Fold 5, Galaxy Z Flip 4, Galaxy Z Flip 5, Note 10+ 5G, Galaxy Tab 4 (8.0, Galaxy Tab E, Galaxy Tab S, Galaxy Tab S2, Galaxy Tab S6, Galaxy Tab S7+ 5G, Galaxy Tab A, Galaxy Tab A 8.0, Galaxy Tab A 8.4, Galaxy Note 20 Ultra 5G, Galaxy A02s, Galaxy A12, Galaxy A01, Galaxy A21, Galaxy A51, Galaxy S7 edge, Galaxy Note 10, Galaxy S20 5G, Gear S2, On5, Galaxy J7 Star, Galaxy J3 Star, Pixel 3, Pixel 3 XL, Pixel 3a, Pixel 3a XL, pixel 4, Pixel 4 XL, Pixel 5, Pixel 6, Pixel 6 Pro, Pixel 6a, Pixel 7 Pro, Pixel 7, Pixel XL, OnePlus 6T, HTC 10, One M9, Aristo 2 Plus, G Pad F 8.0, G Pad 10.1, G Pad x8.3, G4, G5, G6, G7, G7 ThinQ, G8, G8 ThinQ, K10, K20 V, K20 V, K30, K40, K7, Stylo 4, Stylo 5, V10, V20, V30, V40 ThinQ, V50 ThinQ 5G, V60 ThinQ 5G, Velvet 5G, Wing 5G, Edge 2022, moto e play (5th Gen), moto e plus (5th Gen), Moto g pure, Moto g stylus 5G (2021), Moto g stylus 5G (2022), moto g6, moto g7 power, REVVL 2, REVVL 2 Plus, Avid Plus, Obsidian, 7 Pro, REVVL 5G, V60 ThinQ 5G Dual Screen, 7T Pro 5G McLaren, Aristo 4+, moto e 6th gen, Nord N200 5G, REVVL V+ 5G, razr 5G, 9 5G, Nord N300 5G, 10T 5G, REVVL 6 PRO 5G, Stylus 5G, 10 Pro 5G, Voix, Nord N20 5G, 30 XE 5G, G400 5G, one 5G ace, 8 5G, REVVLRY, Stylo 6, K51, REVVL 4, X100 5G, moto g 5G (2022), REVVL 6 5G, Voix, Nexus 9, Onetouch Pixi 7, Onetouch Pop 7 LTE, 3T 8-inch, G Pad 5 10.1 FHD, Joy Tab 2, Tab 8 LE, Tab 10 5G, 9 Pro 5G, Nord N10 5G, REVVL 4+, Nord N100, 8T+ 5G, Pixel Watch, V30+

The products in the preceding list, including all variations, editions, and applications of the foregoing, and all products and apparatuses of T-Mobile similar to the foregoing that include the claimed elements are the ’543 Accused Instrumentalities.

U.S. PATENT NO. 9,198,042

Headwater accuses the following smartphones, basic phones, tablets, laptops, and hotspot devices sold (including those sold in bundles with data plans) or used by T-Mobile for use with T-Mobile’s wireless network services of infringing each of the Asserted Claims of the ’042 patent:

Servers, hardware, software, and services leased, owned, supported, and/or operated by T-Mobile comprising T-Mobile’s wireless network services functionality.

Phones, tablets, wearables, and devices used, sold, offered for sale, or imported within six years of the filing of the date of the lawsuit comprising Apple software (e.g., iOS, WatchOS, etc.) including but not limited to the following: iPad Air, iPad Mini 2, iPhone 5C, iPhone 5S, iPad Air

2, iPad mini 3, iPhone 6, iPhone 6 Plus, iPad mini 4, iPad Pro, 12.9 in., iPhone 6S, iPhone 6S Plus, iPad Pro, 9.7 in, iPhone 7, iPhone 7 Plus, iPhone SE (1st Gen), iPad Pro, 10.5 in., iPad Pro, 12.9 in. (2nd Gen), Watch Series 3, iPhone 8, iPhone 8 Plus, iPhone X, iPad (6th Gen), Watch Series 4, iPad Pro, 11 in. (1st Gen), iPad Pro, 12.9 in. (3rd Gen), iPhone XR, iPhone XS, iPhone XS Max, iPad (7th Gen), iPad Air (3rd Gen), iPad Mini (5th Gen), iPhone 11, iPhone 11 Pro, iPhone 11 Pro Max, Watch Series 5, iPad (8th Gen), iPad Air (4th Gen), iPad Pro, 11 in. (2nd Gen), Watch Series 6, Watch SE, iPad Pro, 12.9 in. (4th Gen), iPhone 12, iPhone 12 Mini, iPhone 12 Pro, iPhone 12 Pro Max, iPhone SE (2nd Gen), iPad (9th Gen), iPad Mini (6th Gen), iPad Pro, 11 in. (3rd Gen), iPad Pro, 12.9 in. (5th Gen), iPhone 13, iPhone 13 Mini, iPhone 13 Pro, iPhone 13 Pro Max, Watch Series 7, iPad (10th Gen), iPad Air (5th Gen), Watch Series 8, Watch SE (2nd Gen), Watch Series 9, iPad Pro (6th Gen), iPhone 14, iPhone 14 Plus, Watch Ultra, Watch Ultra 2, iPhone 14 Pro, iPhone 14 Pro Max, iPhone SE (3rd Gen), iPhone 15, iPhone 15 Pro, iPhone 15 Plus, and iPhone 15 Pro Max.

Phones, tablets, wearables, and devices used, sold, offered for sale, or imported within six years of the filing of the date of the lawsuit comprising Android software (e.g., Android Operating System Platform) including but not limited to the following: Galaxy A03s, Galaxy A10e, Galaxy A13, Galaxy A13 5G, Galaxy A14 5G, Galaxy A20, Galaxy Core Prime, Galaxy J3 Eclipse, Galaxy Note 10+, Galaxy Note 10+ 5G, Galaxy Note 20 5G, Galaxy Note 5, Galaxy Note 6, Galaxy Note 7, Galaxy Note 8, Galaxy Note 9, Galaxy S10, Galaxy S10 5G, Galaxy S10+, Galaxy S10e, Galaxy S20 FE 5G, Galaxy S20 Ultra 5G, Galaxy S20+ 5G, Galaxy S21 5G, Galaxy S21 FE 5G, Galaxy S21 Ultra 5G, Galaxy S21+ 5G, Galaxy S22, Galaxy S22 Ultra, Galaxy S22+, Galaxy S22+, Galaxy S23, Galaxy S23 Ultra, Galaxy S23+, Galaxy S23 FE, Galaxy S5, Galaxy S6, Galaxy S6, Galaxy S6 edge, Galaxy S6 edge +, Galaxy S7, Galaxy S8, Galaxy S8+, Galaxy S9, Galaxy S9+, Galaxy Z Flip 3 5G, Galaxy Z Fold 3 5G, Galaxy Z Fold 4, Galaxy Z Fold 5, Galaxy Z Flip 4, Galaxy Z Flip 5, Note 10+ 5G, Galaxy Tab 4 (8.0, Galaxy Tab E, Galaxy Tab S, Galaxy Tab S2, Galaxy Tab S6, Galaxy Tab S7+ 5G, Galaxy Tab A, Galaxy Tab A 8.0, Galaxy Tab A 8.4, Galaxy Note 20 Ultra 5G, Galaxy A02s, Galaxy A12, Galaxy A01, Galaxy A21, Galaxy A51, Galaxy S7 edge, Galaxy Note 10, Galaxy S20 5G, Gear S2, On5, Galaxy J7 Star, Galaxy J3 Star, Pixel 3, Pixel 3 XL, Pixel 3a, Pixel 3a XL, pixel 4, Pixel 4 XL, Pixel 5, Pixel 6, Pixel 6 Pro, Pixel 6a, Pixel 7 Pro, Pixel 7, Pixel XL, OnePlus 6T, HTC 10, One M9, Aristo 2 Plus, G Pad F 8.0, G Pad 10.1, G Pad x8.3, G4, G5, G6, G7, G7 ThinQ, G8, G8 ThinQ, K10, K20 V, K20 V, K30, K40, K7, Stylo 4, Stylo 5, V10, V20, V30, V40 ThinQ, V50 ThinQ 5G, V60 ThinQ 5G, Velvet 5G, Wing 5G, Edge 2022, moto e play (5th Gen), moto e plus (5th Gen), Moto g pure, Moto g stylus 5G (2021), Moto g stylus 5G (2022), moto g6, moto g7 power, REVVL 2, REVVL 2 Plus, Avid Plus, Obsidian, 7 Pro, REVVL 5G, V60 ThinQ 5G Dual Screen, 7T Pro 5G McLaren, Aristo 4+, moto e 6th gen, Nord N200 5G, REVVL V+ 5G, razr 5G, 9 5G, Nord N300 5G, 10T 5G, REVVL 6 PRO 5G, Stylus 5G, 10 Pro 5G, Voix, Nord N20 5G, 30 XE 5G, G400 5G, one 5G ace, 8 5G, REVVLRY, Stylo 6, K51, REVVL 4, X100 5G, moto g 5G (2022), REVVL 6 5G, Voix, Nexus 9, Onetouch Pixi 7, Onetouch Pop 7 LTE, 3T 8-inch, G Pad 5 10.1 FHD, Joy Tab 2, Tab 8 LE, Tab 10 5G, 9 Pro 5G, Nord N10 5G, REVVL 4+, Nord N100, 8T+ 5G, Pixel Watch, V30+.

The products in the preceding list, including all variations, editions, and applications of the foregoing, and all products and apparatuses of T-Mobile similar to the foregoing that include the claimed elements are the '042 Accused Instrumentalities.

U.S. PATENT NO. 9,215,613

Headwater accuses the following smartphones, basic phones, tablets, laptops, and hotspot devices sold (including those sold in bundles with data plans) or used by T-Mobile for use with T-Mobile's wireless network services of infringing each of the Asserted Claims of the '613 patent:

Servers, hardware, software, and services leased, owned, supported, and/or operated by T-Mobile comprising T-Mobile's wireless network services functionality.

Phones, tablets, wearables, and devices used, sold, offered for sale, or imported within six years of the filing of the date of the lawsuit comprising Apple software (e.g., iOS, WatchOS, etc.) including but not limited to the following: iPad Air, iPad Mini 2, iPhone 5C, iPhone 5S, iPad Air 2, iPad mini 3, iPhone 6, iPhone 6 Plus, iPad mini 4, iPad Pro, 12.9 in., iPhone 6S, iPhone 6S Plus, iPad Pro, 9.7 in, iPhone 7, iPhone 7 Plus, iPhone SE (1st Gen), iPad Pro, 10.5 in., iPad Pro, 12.9 in. (2nd Gen), Watch Series 3, iPhone 8, iPhone 8 Plus, iPhone X, iPad (6th Gen), Watch Series 4, iPad Pro, 11 in. (1st Gen), iPad Pro, 12.9 in. (3rd Gen), iPhone XR, iPhone XS, iPhone XS Max, iPad (7th Gen), iPad Air (3rd Gen), iPad Mini (5th Gen), iPhone 11, iPhone 11 Pro, iPhone 11 Pro Max, Watch Series 5, iPad (8th Gen), iPad Air (4th Gen), iPad Pro, 11 in. (2nd Gen), Watch Series 6, Watch SE, iPad Pro, 12.9 in. (4th Gen), iPhone 12, iPhone 12 Mini, iPhone 12 Pro, iPhone 12 Pro Max, iPhone SE (2nd Gen), iPad (9th Gen), iPad Mini (6th Gen), iPad Pro, 11 in. (3rd Gen), iPad Pro, 12.9 in. (5th Gen), iPhone 13, iPhone 13 Mini, iPhone 13 Pro, iPhone 13 Pro Max, Watch Series 7, iPad (10th Gen), iPad Air (5th Gen), Watch Series 8, Watch SE (2nd Gen), Watch Series 9, iPad Pro (6th Gen), iPhone 14, iPhone 14 Plus, Watch Ultra, Watch Ultra 2, iPhone 14 Pro, iPhone 14 Pro Max, iPhone SE (3rd Gen), iPhone 15, iPhone 15 Pro, iPhone 15 Plus, and iPhone 15 Pro Max.

Phones, tablets, wearables, and devices used, sold, offered for sale, or imported within six years of the filing of the date of the lawsuit comprising Android software (e.g., Android Operating System Platform) including but not limited to the following: Galaxy A03s, Galaxy A10e, Galaxy A13, Galaxy A13 5G, Galaxy A14 5G, Galaxy A20, Galaxy Core Prime, Galaxy J3 Eclipse, Galaxy Note 10+, Galaxy Note 10+ 5G, Galaxy Note 20 5G, Galaxy Note 5, Galaxy Note 6, Galaxy Note 7, Galaxy Note 8, Galaxy Note 9, Galaxy S10, Galaxy S10 5G, Galaxy S10+, Galaxy S10e, Galaxy S20 FE 5G, Galaxy S20 Ultra 5G, Galaxy S20+ 5G, Galaxy S21 5G, Galaxy S21 FE 5G, Galaxy S21 Ultra 5G, Galaxy S21+ 5G, Galaxy S22, Galaxy S22 Ultra, Galaxy S22+, Galaxy S22+, Galaxy S23, Galaxy S23 Ultra, Galaxy S23+, Galaxy S23 FE, Galaxy S5, Galaxy S6, Galaxy S6, Galaxy S6 edge, Galaxy S6 edge +, Galaxy S7, Galaxy S8, Galaxy S8+, Galaxy S9, Galaxy S9+, Galaxy Z Flip 3 5G, Galaxy Z Fold 3 5G, Galaxy Z Fold 4, Galaxy Z Fold 5, Galaxy Z Flip 4, Galaxy Z Flip 5, Note 10+ 5G, Galaxy Tab 4 (8.0, Galaxy Tab E, Galaxy Tab S,

Galaxy Tab S2, Galaxy Tab S6, Galaxy Tab S7+ 5G, Galaxy Tab A, Galaxy Tab A 8.0, Galaxy Tab A 8.4, Galaxy Note 20 Ultra 5G, Galaxy A02s, Galaxy A12, Galaxy A01, Galaxy A21, Galaxy A51, Galaxy S7 edge, Galaxy Note 10, Galaxy S20 5G, Gear S2, On5, Galaxy J7 Star, Galaxy J3 Star, Pixel 3, Pixel 3 XL, Pixel 3a, Pixel 3a XL, pixel 4, Pixel 4 XL, Pixel 5, Pixel 6, Pixel 6 Pro, Pixel 6a, Pixel 7 Pro, Pixel 7, Pixel XL, OnePlus 6T, HTC 10, One M9, Aristo 2 Plus, G Pad F 8.0, G Pad 10.1, G Pad x8.3, G4, G5, G6, G7, G7 ThinQ, G8, G8 ThinQ, K10, K20 V, K20 V, K30, K40, K7, Stylo 4, Stylo 5, V10, V20, V30, V40 ThinQ, V50 ThinQ 5G, V60 ThinQ 5G, Velvet 5G, Wing 5G, Edge 2022, moto e play (5th Gen), moto e plus (5th Gen), Moto g pure, Moto g stylus 5G (2021), Moto g stylus 5G (2022), moto g6, moto g7 power, REVVL 2, REVVL 2 Plus, Avid Plus, Obsidian, 7 Pro, REVVL 5G, V60 ThinQ 5G Dual Screen, 7T Pro 5G McLaren, Aristo 4+, moto e 6th gen, Nord N200 5G, REVVL V+ 5G, razr 5G, 9 5G, Nord N300 5G, 10T 5G, REVVL 6 PRO 5G, Stylus 5G, 10 Pro 5G, Voix, Nord N20 5G, 30 XE 5G, G400 5G, one 5G ace, 8 5G, REVVLRY, Stylo 6, K51, REVVL 4, X100 5G, moto g 5G (2022), REVVL 6 5G, Voix, Nexus 9, Onetouch Pixi 7, Onetouch Pop 7 LTE, 3T 8-inch, G Pad 5 10.1 FHD, Joy Tab 2, Tab 8 LE, Tab 10 5G, 9 Pro 5G, Nord N10 5G, REVVL 4+, Nord N100, 8T+ 5G, Pixel Watch, V30+.

The products in the preceding list, including all variations, editions, and applications of the foregoing, and all products and apparatuses of T-Mobile similar to the foregoing that include the claimed elements are the ’613 Accused Instrumentalities.

P.R. 3-1(C): CLAIM CHARTS

Headwater’s analysis of T-Mobile’s products and apparatuses is based upon information that is publicly available and based on Headwater’s own investigation prior to any discovery in this action.

While the publicly available information constitutes evidence of the methods and apparatuses used by Headwater in the Accused Instrumentalities, direct evidence of the actual apparatuses and methods are at times not publicly available. Accordingly, these infringement contentions are based on the available public information, analysis, and reasonable inferences drawn from that information.

Headwater reserves the right to amend or supplement these disclosures for any of the following reasons (along with any other reason that may be permitted under the court’s rules and orders):

(1) T-Mobile provides evidence of the apparatuses and methods used in the Accused Instrumentalities;

(2) The Asserted Claims may include elements that involve features that are implemented by hardware structures and logic and Headwater's current positions on infringement are set forth without the benefit of access to T-Mobile's source code, schematics, drawings, or other proprietary specifications or information, which cannot be obtained through publicly available information, for the Accused Instrumentalities. Therefore, it may be necessary for Headwater to supplement its positions on infringement after a complete production of such proprietary specifications or information by T-Mobile;

(3) Headwater's position on infringement of specific claims will depend on the claim constructions adopted by the Court. Because said constructions have not yet occurred, Headwater cannot take a final position on the bases for infringement of the Asserted Claims; and

(4) Headwater's investigation and analysis of T-Mobile's Accused Instrumentalities are based upon information made publicly available by T-Mobile and by Headwater's own investigations. Headwater reserves the right to amend these contentions based upon discovery of non-public information that Headwater anticipates receiving from T-Mobile during discovery.

Attached as Exhibits A through D, and incorporated herein in their entirety, are charts identifying where each element of the Asserted Claims of the '541, '543, '042, and '613 patents are found in the Accused Instrumentalities.

Unless otherwise indicated, the information provided that corresponds to each claim element is considered to indicate that each claim element is found within each of the different variations, versions, editions, and applications of each respective Accused Instrumentalities.

P.R. 3-1(D): LITERAL INFRINGEMENT AND DOCTRINE OF EQUIVALENTS

With respect to the patents at issue, Headwater contends that each element of each Asserted Claim is literally present. To the extent that T-Mobile identifies elements of the Asserted Claims that it contends are not literally present in the Accused Instrumentalities, Headwater contends that such elements are present under the doctrine of equivalents.

P.R. 3-1(E): PRIORITY DATES

U.S. Patent No.	*Priority Date*
8,589,541	January 28, 2009
8,924,543	January 28, 2009
9,198,042	January 28, 2009
9,215,613	January 28, 2009

P.R. 3-1(F): IDENTIFICATION OF INSTRUMENTALITIES PRACTICING THE CLAIMED INVENTION

The ItsOn software may incorporate or reflect the claims of the Asserted Patents. Headwater reserves the right to supplement this response should further investigation, discovery, or the court's claim construction rulings make such supplementation appropriate.

P.R. 3-2: DOCUMENT PRODUCTION ACCOMPANYING DISCLOSURE

P.R. 3-2(A) DOCUMENTS

Headwater is presently unaware of any documents that evidence any discussion with, disclosure to, or other manner of providing to a third party, or sale of or offer to sell, any of the inventions claimed in the patents in suit prior to their respective application dates.

A diligent search continues for documents, and Headwater reserves the right to supplement this response.

P.R. 3-2(B) DOCUMENTS

Headwater is presently unaware of any documents that evidence the conception, reduction to practice, design, or development of the claimed inventions, which were created on or before the application dates of the patents in suit or priority date identified pursuant to P.R. 3-1(e).

A diligent search continues for documents, and Headwater reserves the right to supplement this response.

P.R. 3-2(C) DOCUMENTS

The file histories for the ’541, ’543, ’042, and ’613 patents may be found in Headwater’s production.

Date: November 20, 2023

/s/ Marc Fenster

Marc Fenster
CA State Bar No. 181067
Reza Mirzaie
CA State Bar No. 246953
Brian Ledahl
CA State Bar No. 186579
Ben Wang
CA State Bar No. 228712
Paul Kroeger
CA State Bar No. 229074
Neil A. Rubin
CA State Bar No. 250761
Kristopher Davis
CA State Bar No. 329627
James S. Tsuei
CA State Bar No. 285530
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ATTORNEYS FOR PLAINTIFF, Headwater Research LLC

CERTIFICATE OF SERVICE

I certify that this document is being served upon counsel of record for Defendants on November 20, 2023 via electronic mail.

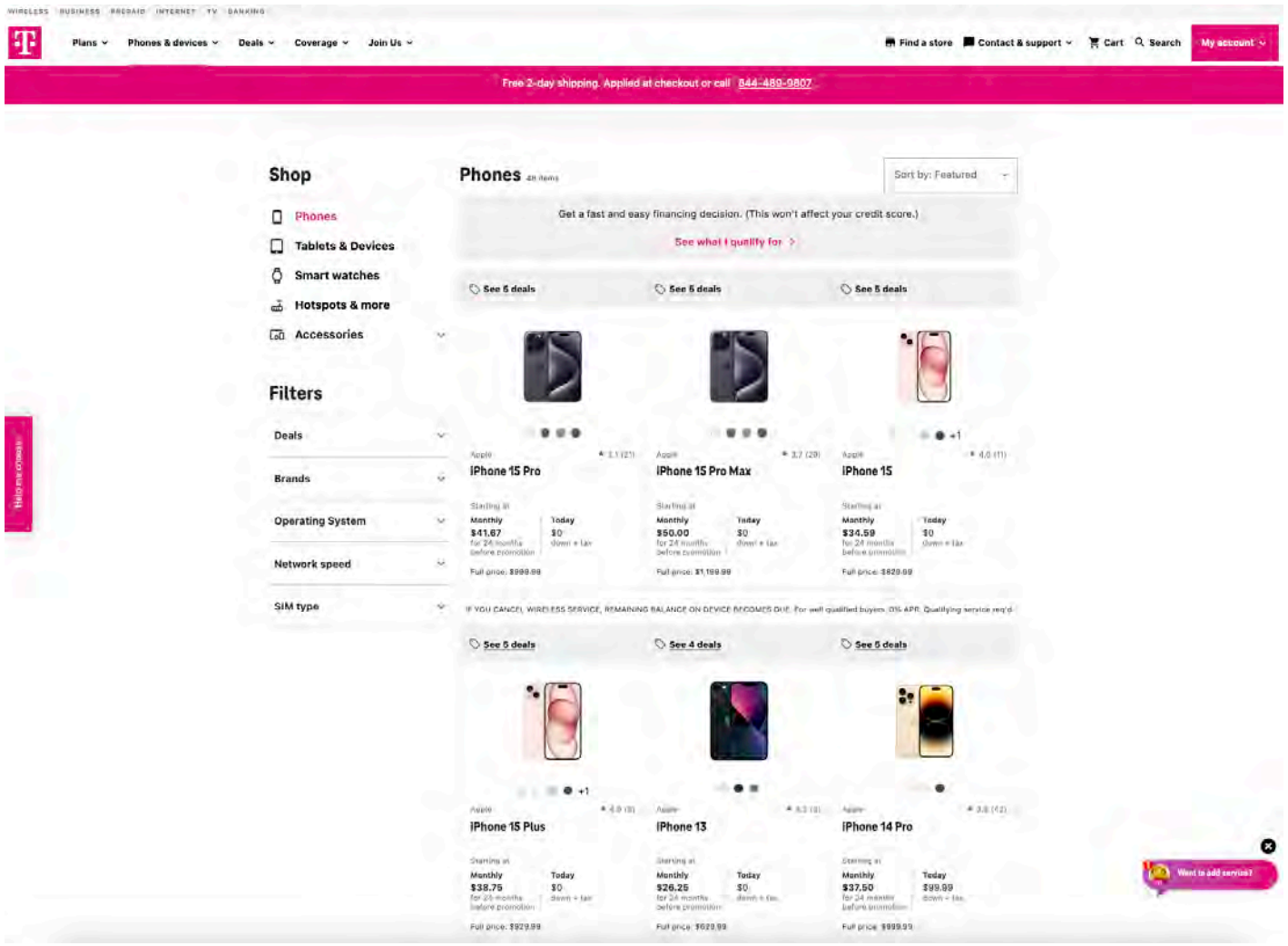
/s/ *Marc Fenster*
Marc Fenster

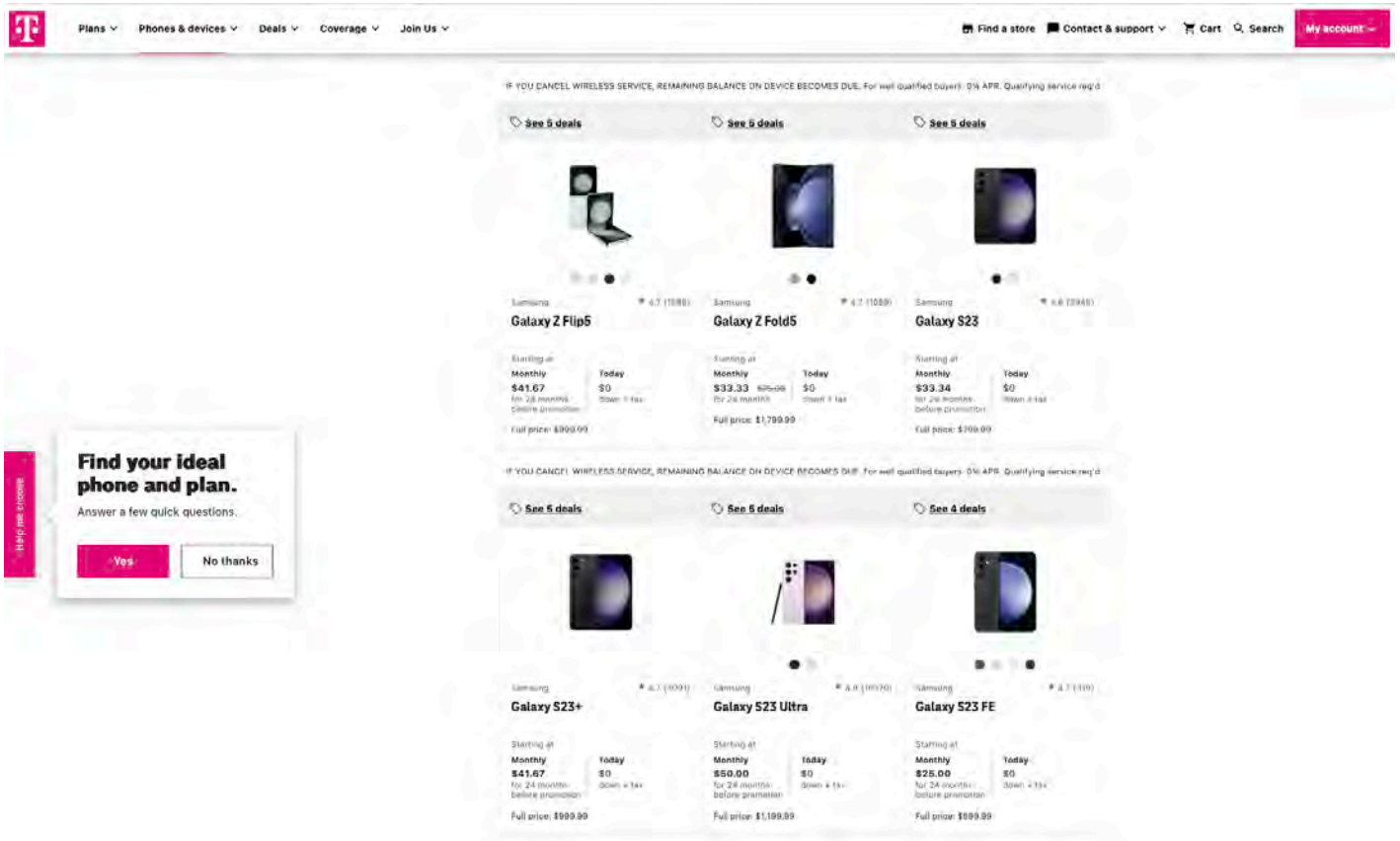
Exhibit A - U.S. Patent No. 8,589,541 ("'541 Patent")

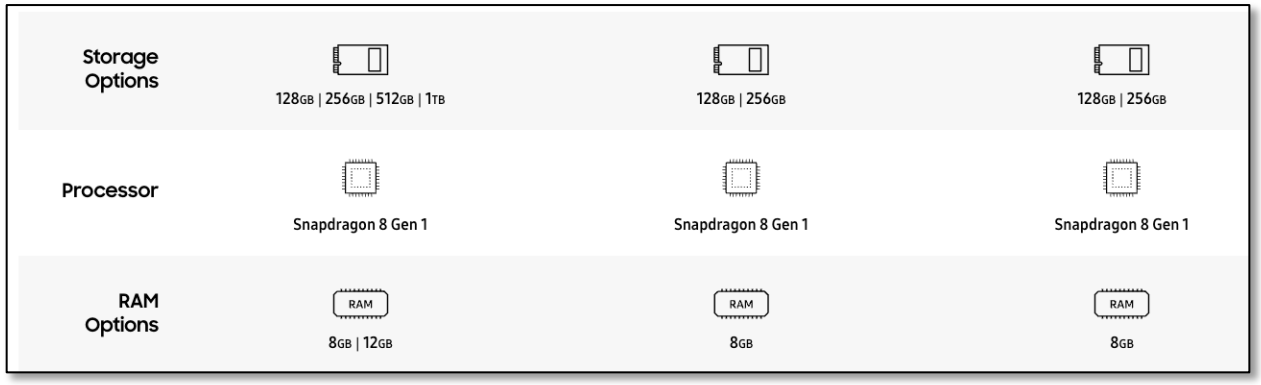
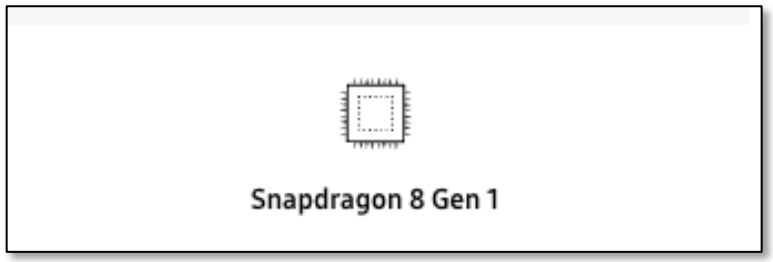
Accused Instrumentalities: smartphones, basic phones, tablets, laptops, and hotspot devices sold (including those sold in bundles with data plans) or used by T-Mobile and all versions and variations thereof ("Accused Instrumentalities") since the issuance of U.S. Pat. No. 8,589,541 (the "Asserted Patent").

Claim 1

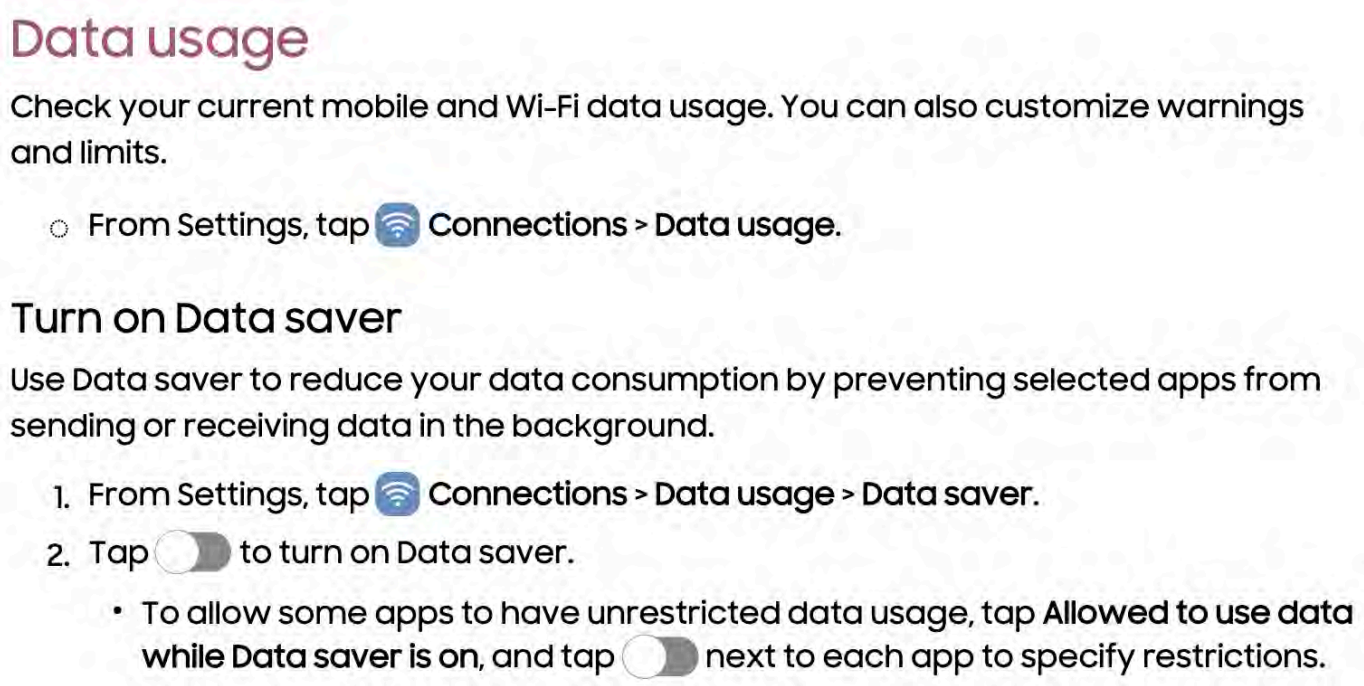
Claim	Public Documentation
[1a] A non-transitory computer-readable storage medium storing machine-executable instructions that, when executed by one or more processors of a wireless end-user device, cause the one or more processors to:	The Accused Instrumentalities include "A non-transitory computer-readable storage medium storing machine-executable instructions that, when executed by one or more processors of a wireless end-user device, cause the one or more processors to." For example, T-Mobile sells and uses devices described by T-Mobile's website below (e.g., devices made by Samsung, Apple, Motorola, Google, Nokia, etc.). These devices constitute a wireless end-user device as described in claim 1. *See, e.g.* https://www.t-mobile.com/cell-phones

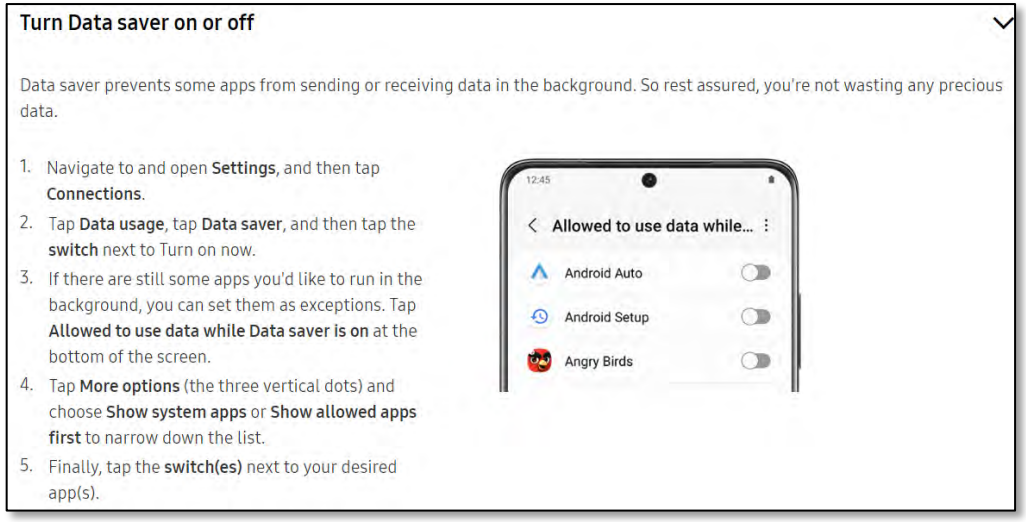
Claim	Public Documentation
	

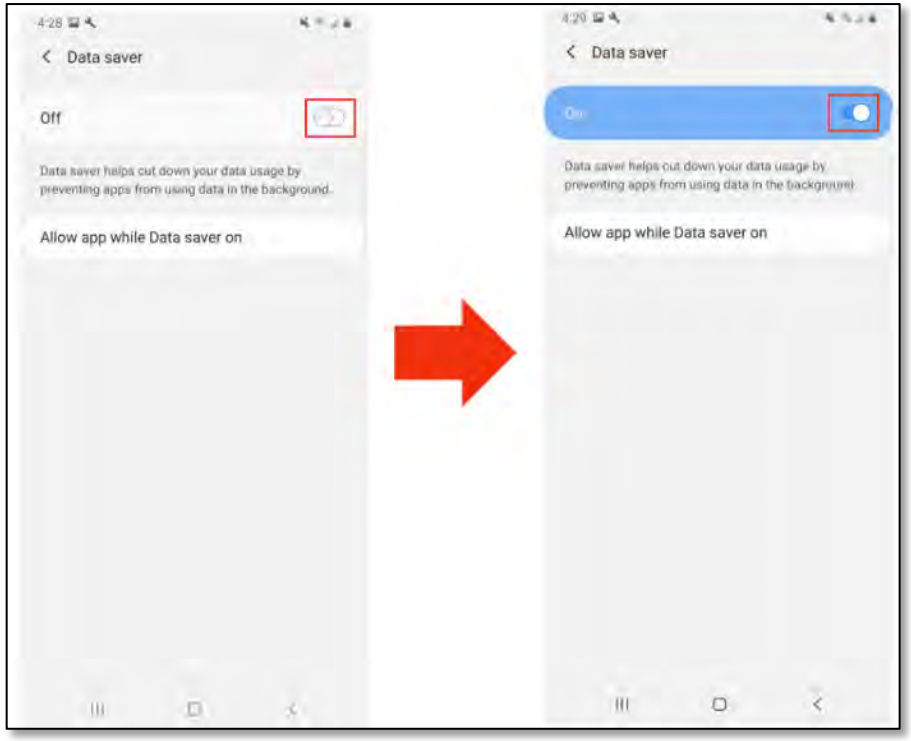
Claim	Public Documentation
	 ; *see also* https://www.t-mobile.com/tablets; https://www.t-mobile.com/smart-watches; https://www.t-mobile.com/hotspots-iot-connected-devices. For further example, the Samsung Galaxy S22 model is sold or used by T-Mobile and includes 8GB RAM and either 128GB or 256GB non-removable memory storage, in which control policies for applications are stored. *See, e.g.*, https://www.samsung.com/us/smartphones/galaxy-s22/buy/galaxy-s22-128gb-unlocked-sm-s901uzkaxaa/:

Claim	Public Documentation
	 For further example, the Galaxy S22 has either a Snapdragon (in the United States) or Exynos (in Korea) architecture-based application processor. *See, e.g.*, https://www.samsung.com/us/smartphones/galaxy-s22/buy/galaxy-s22-128gb-unlocked-sm-s901uzkaxaa/:  For further example, the Apple iPhone 15 Pro model is sold or used by T-Mobile and includes 128GB, 256GB, 512GB, or 1TB of memory storage, in which control policies for applications are stored. *See, e.g.*, https://www.apple.com/iphone-15-pro/specs/:

Claim	Public Documentation
	 For further example, the Apple iPhone 15 Pro model has a A17 Pro Chip. *See, e.g.*, https://www.apple.com/iphone-15-pro/specs/
[1b] identify a service usage activity of the wireless end-user device, the service usage activity being associated with a first software component of a plurality of software components on the wireless end-user device, the service usage activity comprising one or more prospective or successful communications over a wireless network;	The Accused Instrumentalities "identify a service usage activity of the wireless end-user device, the service usage activity being associated with a first software component of a plurality of software components on the wireless end-user device, the service usage activity comprising one or more prospective or successful communications over a wireless network." For example, Samsung's "Data Saver," or "Power Saver," "Doze Mode," "App Standby," "Adaptive Battery," and/or "JobScheduler" features apply to at least some service usage activities associated with a software component comprising prospective or successful communications over a wireless network. *See, e.g.*, https://www.t-mobile.com/support/public-files/attachments/samsung/samsung-galaxy-s21-fe-5g/Samsung%20Galaxy%20S21%20FE%205G_English%20User%20Guide_FINAL2.pdf:

Claim	Public Documentation
	 ; https://www.samsung.com/us/support/answer/ANS00079018/:

Claim	Public Documentation
	 ; https://www.samsung.com/ae/support/mobile-devices/android-pie-what-is-the-data-saver-feature/:

Claim	Public Documentation
	

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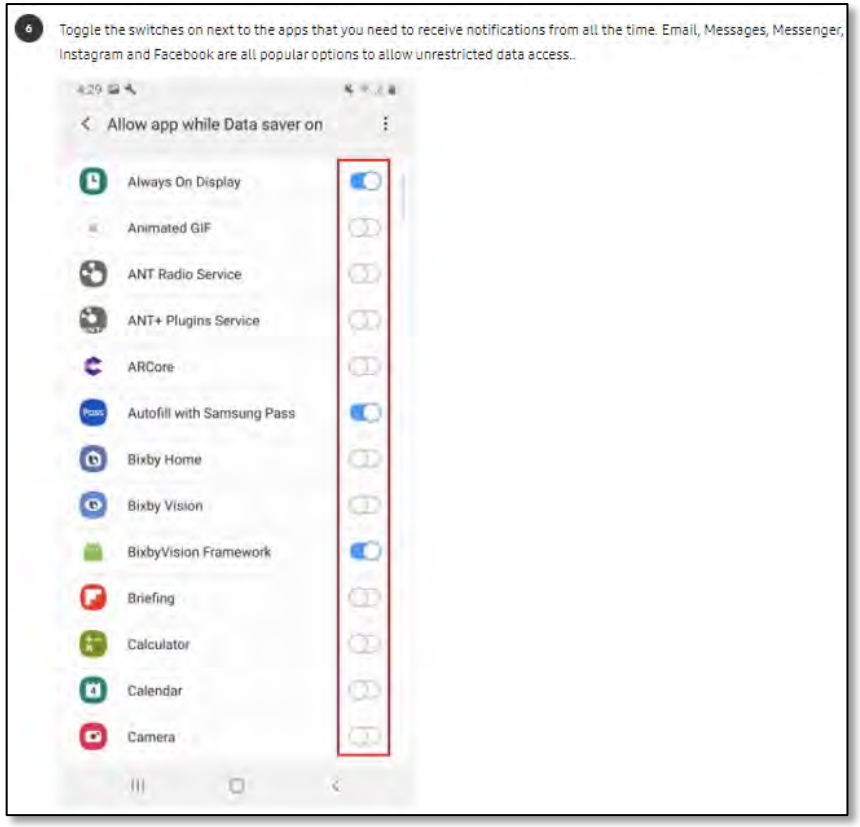
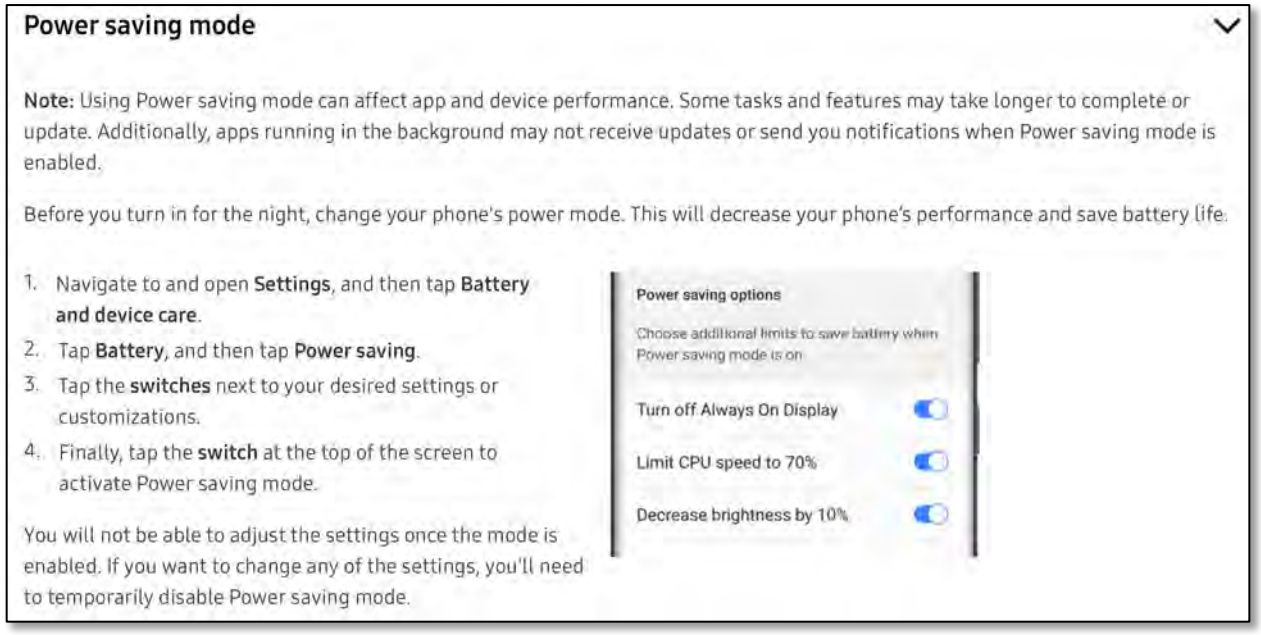
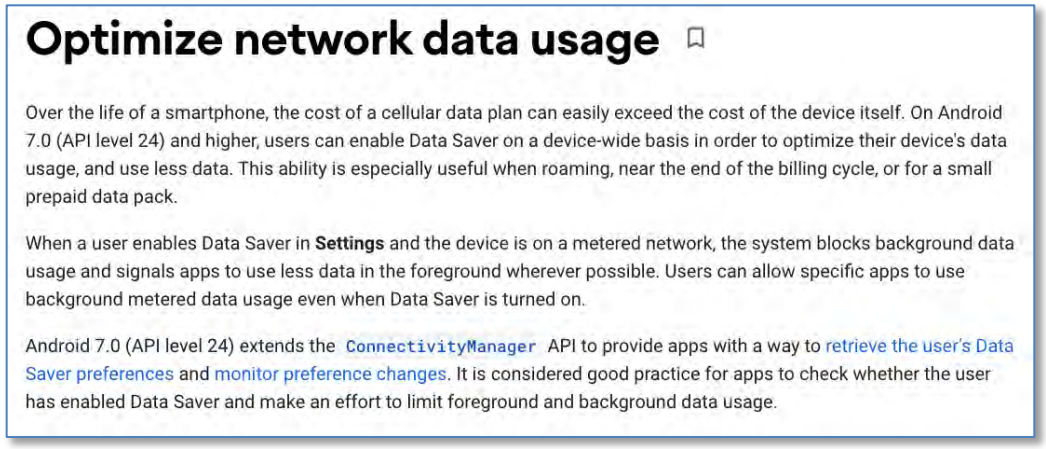
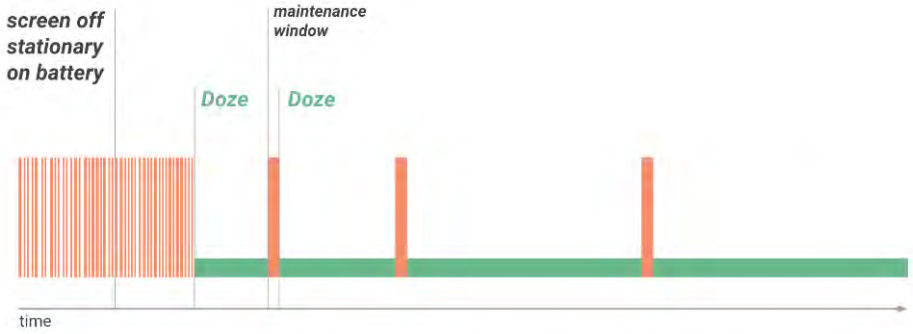
	 ; https://www.samsung.com/us/support/answer/ANS00078987/:

Claim	Public Documentation
	 ; https://developer.android.com/training/basics/network-ops/data-saver: 

Claim	Public Documentation

	Check data saver preferences
	
	On Android 7.0 (API level 24) and higher, apps can use the `ConnectivityManager` API to determine what data usage restrictions are being applied. The `getRestrictBackgroundStatus()` method returns one of the following values:
	
	`RESTRICT_BACKGROUND_STATUS_DISABLED`
	Data Saver is disabled.
	
	`RESTRICT_BACKGROUND_STATUS_ENABLED`
	The user has enabled Data Saver for this app. Apps should make an effort to limit data usage in the foreground and gracefully handle restrictions to background data usage.
	
	`RESTRICT_BACKGROUND_STATUS_WHITELISTED`
	The user has enabled Data Saver but the app is allowed to bypass it. Apps should still make an effort to limit foreground and background data usage.
	
	Limit data usage whenever the device is connected to a metered network, even if Data Saver is disabled or the app is allowed to bypass it. The following sample code uses `ConnectivityManager.isActiveNetworkMetered()` and `ConnectivityManager.getRestrictBackgroundStatus()` to determine how much data the app should use:
	
	; https://developer.android.com/training/monitoring-device-state/doze-standby:
	
	Optimize for Doze and App Standby
	
	Starting from Android 6.0 (API level 23), Android introduces two power-saving features that extend battery life for users by managing how apps behave when a device is not connected to a power source. *Doze* reduces battery consumption by deferring background CPU and network activity for apps when the device is unused for long periods of time. *App Standby* defers background network activity for apps with which the user has not recently interacted.
	
	While the device is in Doze, apps' access to certain battery-intensive resources is deferred until maintenance windows. The specific restrictions are listed in Power Management Restrictions.
	
	Doze and App Standby manage the behavior of all apps running on Android 6.0 or higher, regardless whether they are specifically targeting API level 23. To ensure the best experience for users, test your app in Doze and App Standby modes and make any necessary adjustments to your code. The sections below provide details.

Claim	Public Documentation
	Understanding Doze If a user leaves a device unplugged and stationary for a period of time, with the screen off, the device enters Doze mode. In Doze mode, the system attempts to conserve battery by restricting apps' access to network and CPU-intensive services. It also prevents apps from accessing the network and defers their jobs, syncs, and standard alarms. Periodically, the system exits Doze for a brief time to let apps complete their deferred activities. During this *maintenance window*, the system runs all pending syncs, jobs, and alarms, and lets apps access the network.  **Figure 1.** Doze provides a recurring maintenance window for apps to use the network and handle pending activities. At the conclusion of each maintenance window, the system again enters Doze, suspending network access and deferring jobs, syncs, and alarms. Over time, the system schedules maintenance windows less and less frequently, helping to reduce battery consumption in cases of longer-term inactivity when the device is not connected to a charger. As soon as the user wakes the device by moving it, turning on the screen, or connecting a charger, the system exits Doze and all apps return to normal activity. The Doze restriction on network access is also likely to affect your app, especially if the app relies on real-time messages such as tickles or notifications. If your app requires a persistent connection to the network to receive messages, you should use Firebase Cloud Messaging (FCM) if possible. ; https://developer.android.com/topic/performance/appstandby:

App Standby Buckets

Android 9 (API level 28) and higher support **App Standby Buckets**. App Standby Buckets help the system prioritize apps' requests for resources based on how recently and how frequently the apps are used. Based on app usage patterns, each app is placed in one of five priority **buckets**. The system limits the device resources available to each app based on which bucket the app is in.

Priority buckets

The system dynamically assigns each app to a priority bucket, reassigning the apps as needed. The system may rely on a preloaded app that uses machine learning to determine how likely each app is to be used, and assigns apps to the appropriate buckets. If the system app is not present on a device, the system defaults to sorting apps based on how recently they were used. More active apps are assigned to buckets that give the apps higher priority, making more system resources available to the app. In particular, the bucket determines how frequently the app's jobs run, and how often the app can trigger alarms. These restrictions apply only while the device is on battery power; the system does not impose these restrictions on apps while the device is charging.

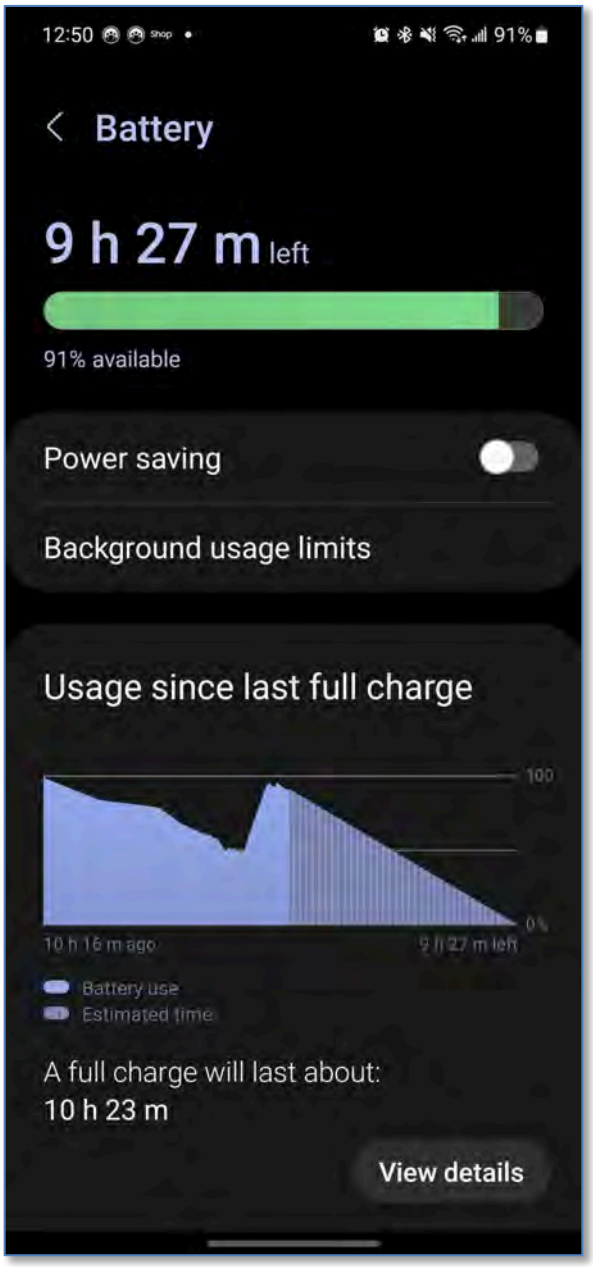
Note: Every manufacturer can set their own criteria for how non-active apps are assigned to buckets. You should not try to influence which bucket your app is assigned to. Instead, focus on making sure your app behaves well in whatever bucket it might be in. Your app can find out what bucket it's currently in by calling `UsageStatsManager.getAppStandbyBucket()`.

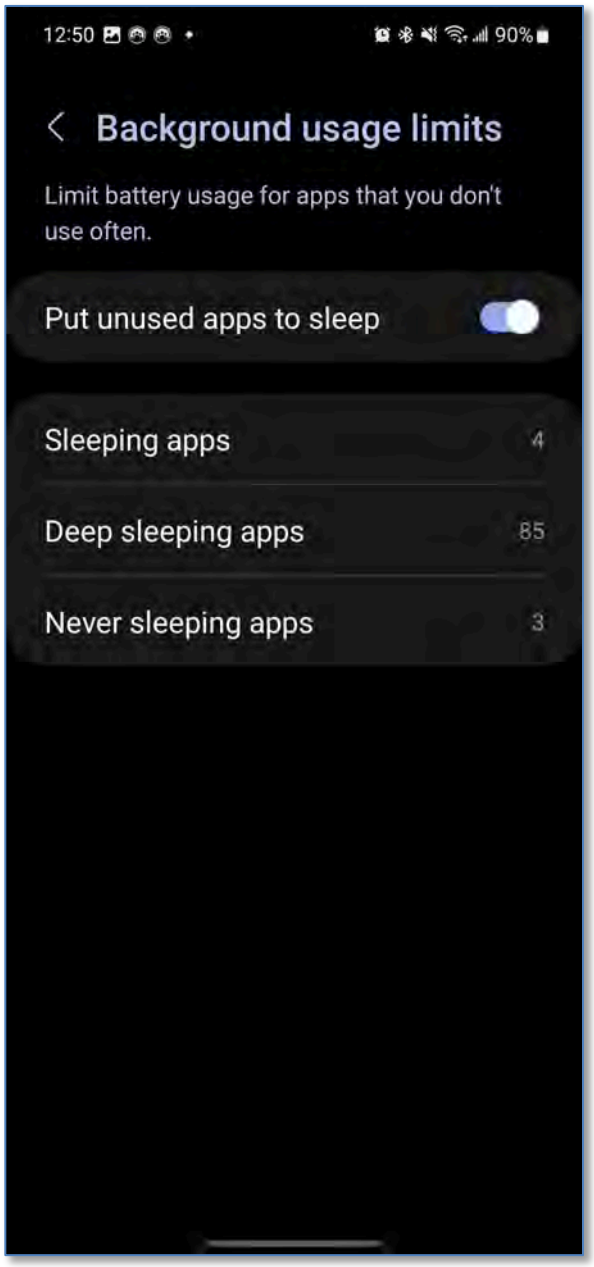
The buckets are:

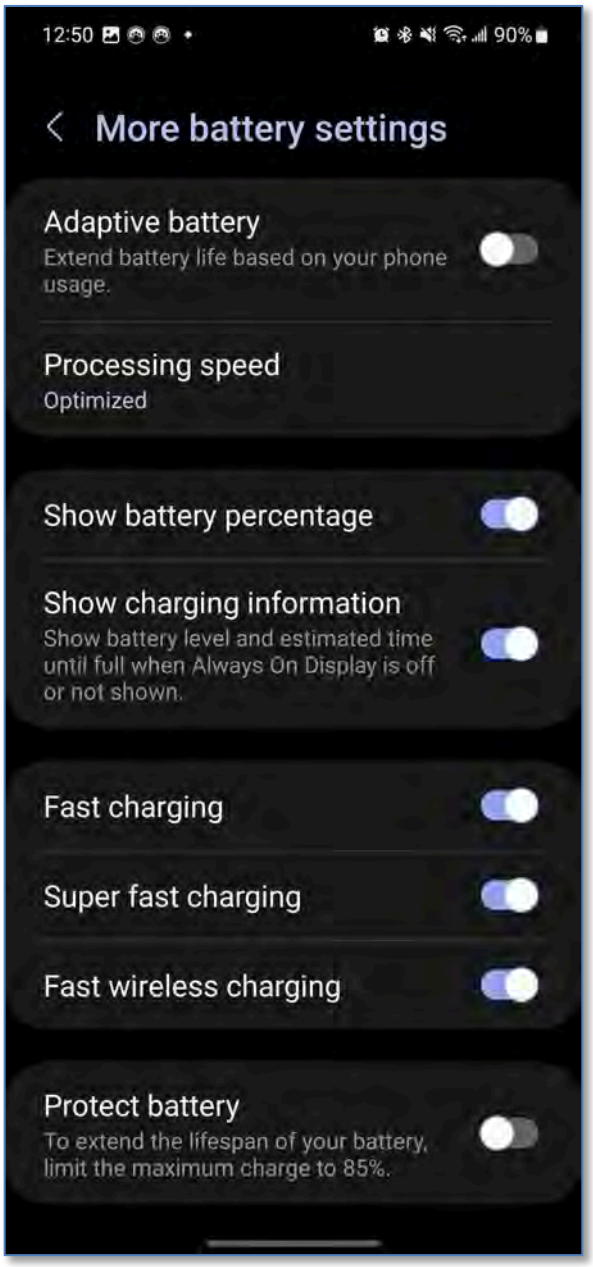
1. Active: App is currently being used or was very recently used.
2. Working set: App is in regular use.
3. Frequent: App is often used, but not every day.
4. Rare: App is not frequently used.
5. Restricted: App consumes a great deal of system resources, or may exhibit undesirable behavior.

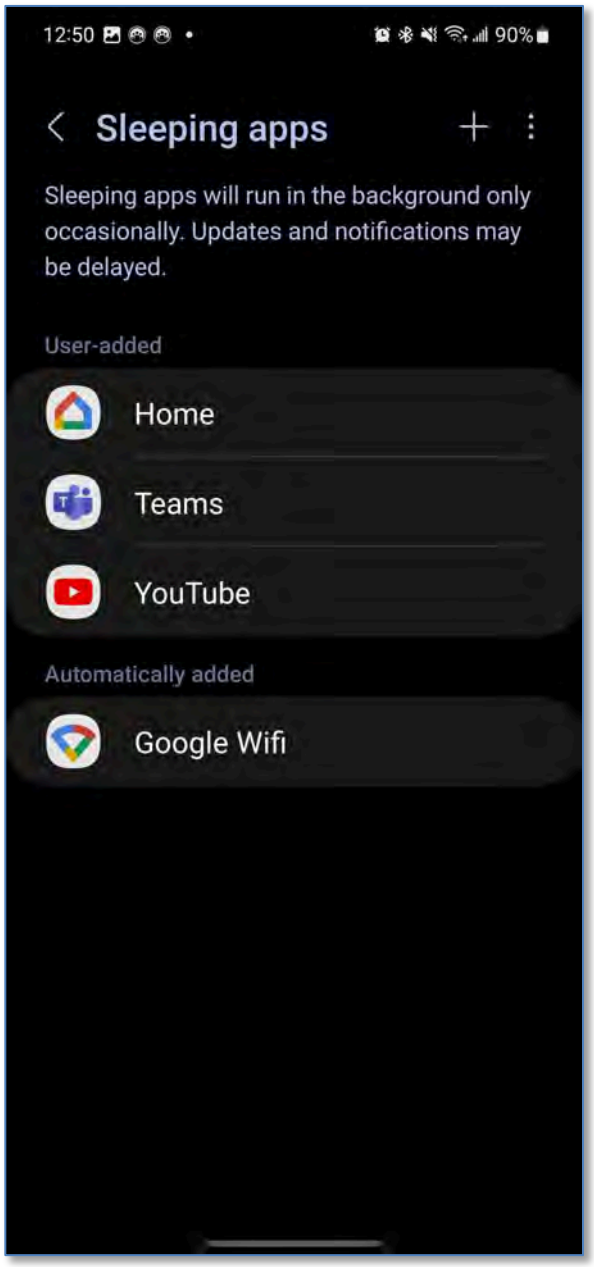
In addition, there's a special **never** bucket for apps that have been installed but have never been run. The system imposes severe restrictions on these apps.

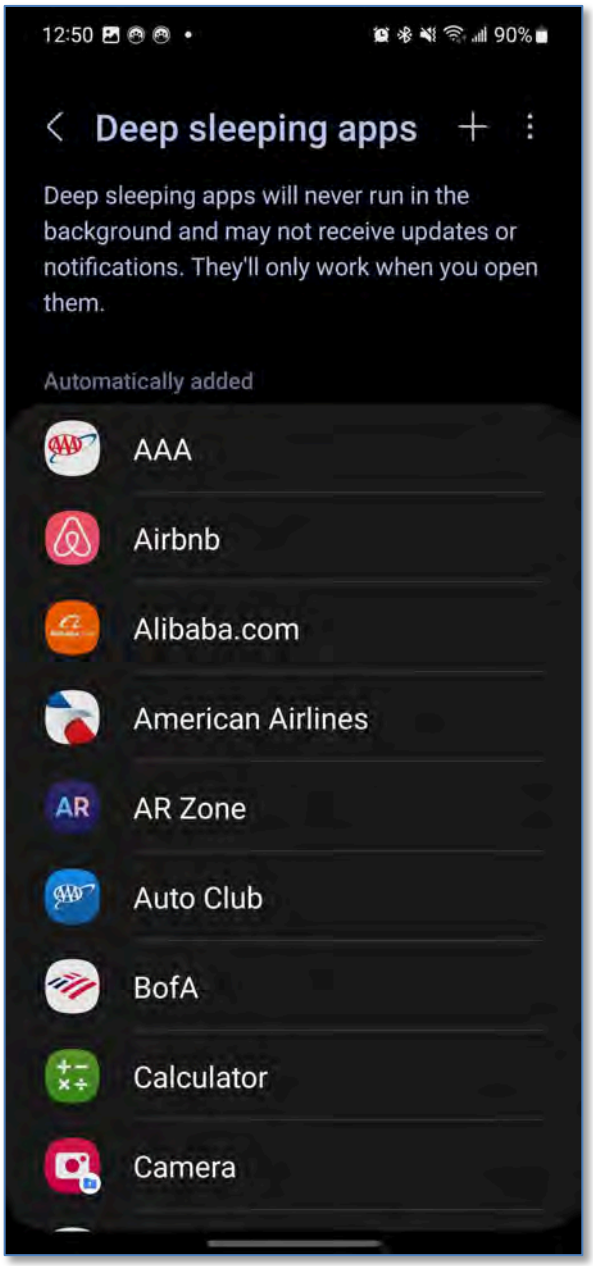
Claim	Public Documentation
	; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler; https://developer.android.com/guide/background/persistent; https://developer.android.com/guide/components/services; https://developer.android.com/guide/components/activities/intro-activities; https://developer.android.com/reference/java/net/URLConnection; https://developer.android.com/training/articles/security-ssl; https://developer.android.com/reference/android/net/DnsResolver; https://developer.android.com/guide/topics/media; https://developer.android.com/media; https://developer.android.com/guide/topics/media/platform/mediaplayer; https://developer.apple.com/documentation/networkextension/dns_settings; *see also* the exemplary screenshots below:

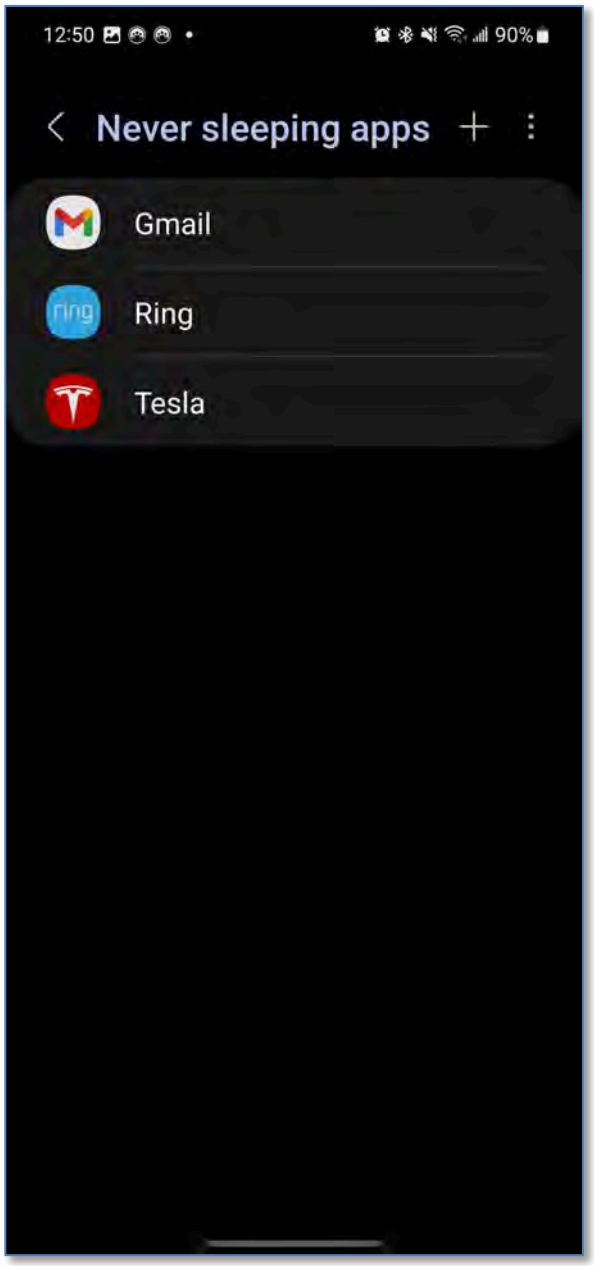

12:50
91%
Battery
9 h 27 m left
91% available
Power saving
Background usage limits
Usage since last full charge
100
0%
10 h 16 m ago
9 h 27 m left
Battery use
Estimated time
A full charge will last about:
10 h 23 m
View details

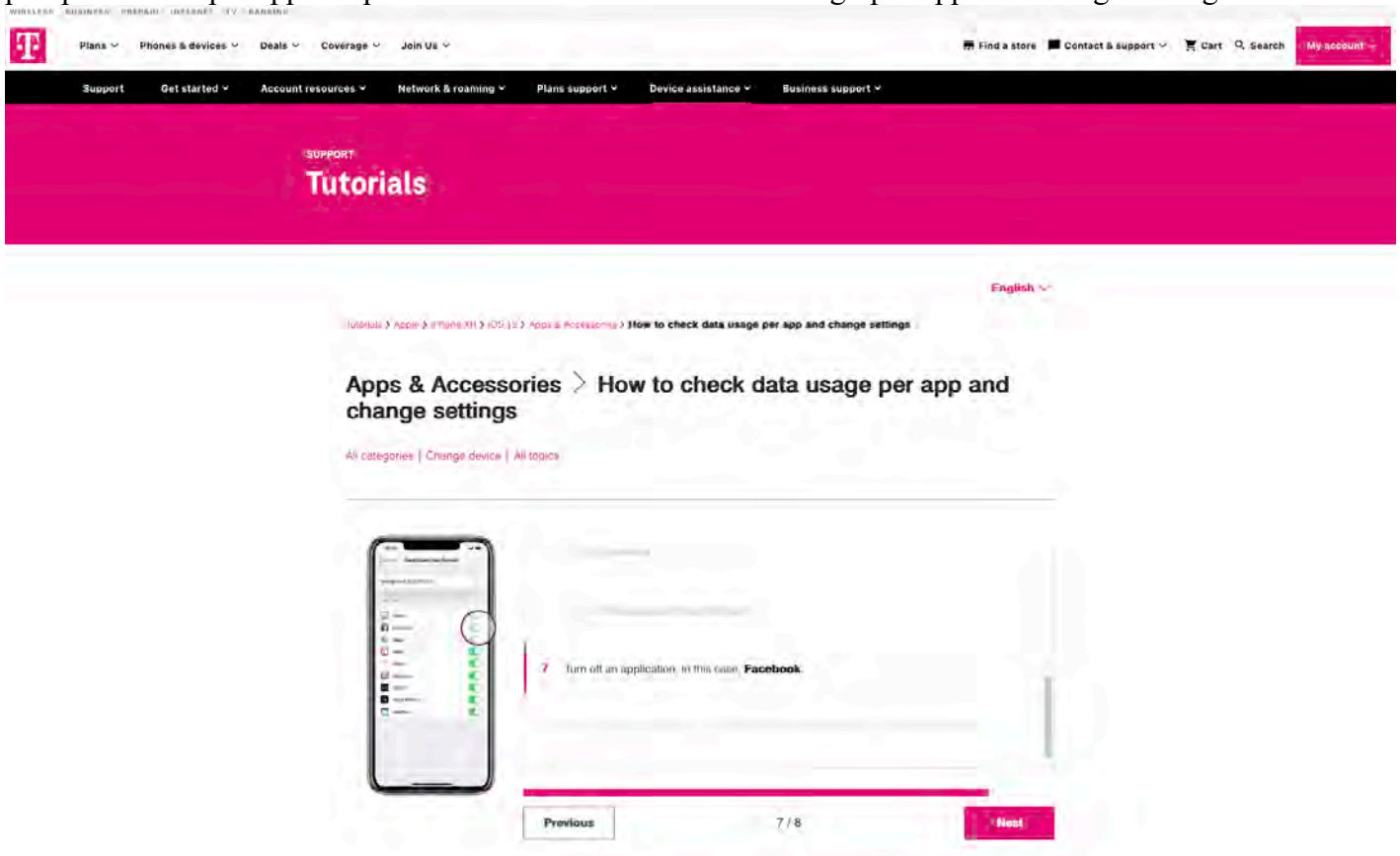

12:50
90%
Background usage limits
Limit battery usage for apps that you don't use often.
Put unused apps to sleep
Sleeping apps 4
Deep sleeping apps 85
Never sleeping apps 3


12:50
90%
More battery settings
Adaptive battery
Extend battery life based on your phone usage.
Processing speed
Optimized
Show battery percentage
Show charging information
Show battery level and estimated time until full when Always On Display is off or not shown.
Fast charging
Super fast charging
Fast wireless charging
Protect battery
To extend the lifespan of your battery, limit the maximum charge to 85%.


12:50
90%
Sleeping apps
Sleeping apps will run in the background only occasionally. Updates and notifications may be delayed.
User-added
Home
Teams
YouTube
Automatically added
Google Wifi


12:50
90%
Deep sleeping apps
Deep sleeping apps will never run in the background and may not receive updates or notifications. They'll only work when you open them.
Automatically added
AAA
Airbnb
Alibaba.com
American Airlines
AR Zone
Auto Club
BofA
Calculator
Camera


12:50
90%
Never sleeping apps
Gmail
Ring
Tesla

Claim	Public Documentation
	As another example, at least Apple's "Background App Refresh" and "Low Power Mode" settings apply to at least some service usage activities associated with a software component comprising prospective or successful communications over a wireless network. *See, e.g.*, https://www.t-mobile.com/support/tutorials/device/apple/iphone-xr/topic/apps-amp-accessories/how-to-check-data-usage-per-app-and-change-settings/7  ; https://support.apple.com/en-us/HT202070:

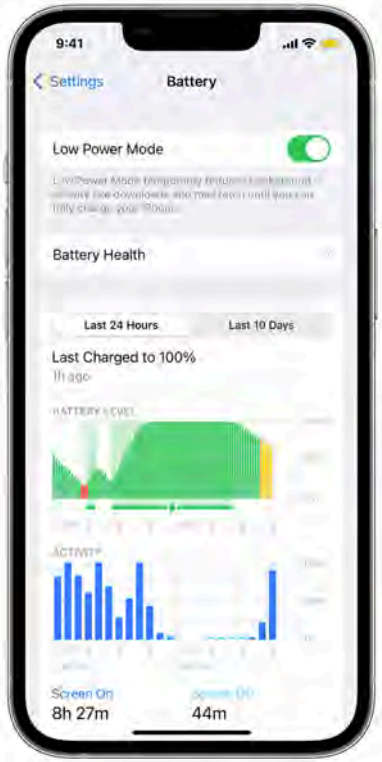
Claim	Public Documentation
	 https://support.apple.com/en-us/HT205234:

Use Low Power Mode to save battery life on your iPhone or iPad

Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.



Low Power Mode reduces or affects these features:

- 5G (except for video streaming) on iPhone 12 and iPhone 13 models[1]
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display[2]
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.

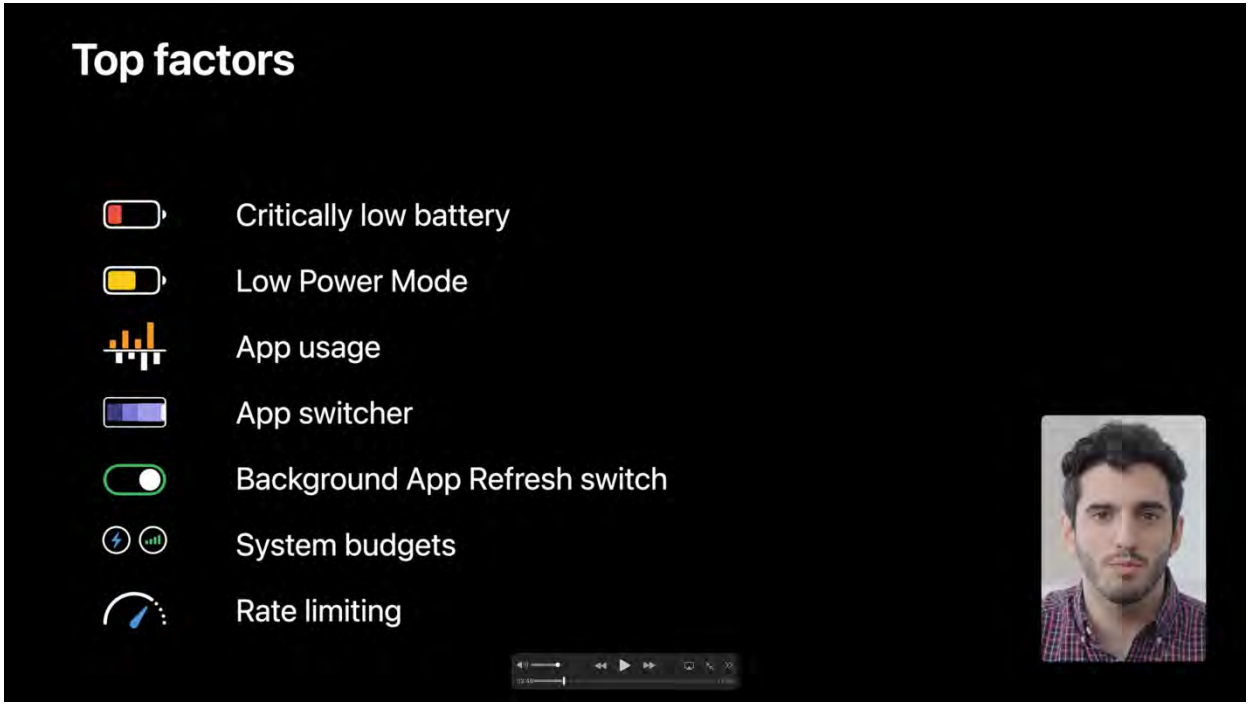
1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

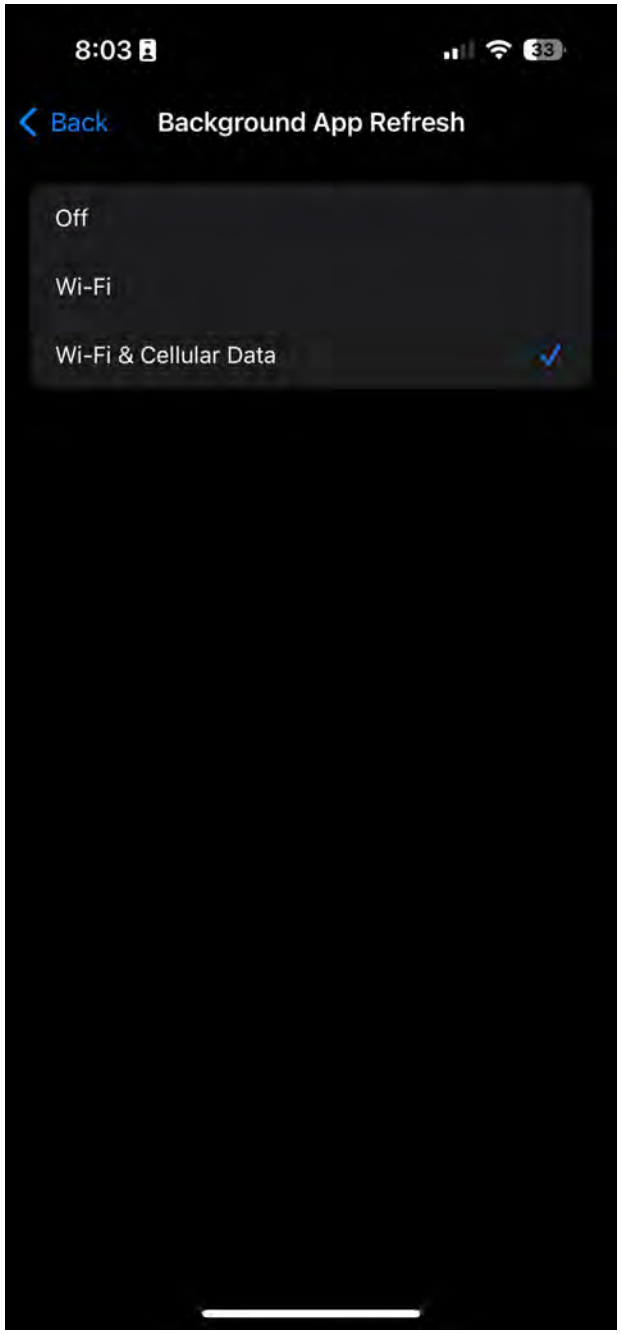
2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

Claim	Public Documentation
	https://www.apple.com/batteries/maximizing-performance/: **View Battery Usage information** With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery. Here are the messages you may see listed below the apps you've been using: **Background Activity.** This indicates that the battery was used by the app while it was in the background — that is, while you were using another app. • To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely. • If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data. ; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/; https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/prepar-

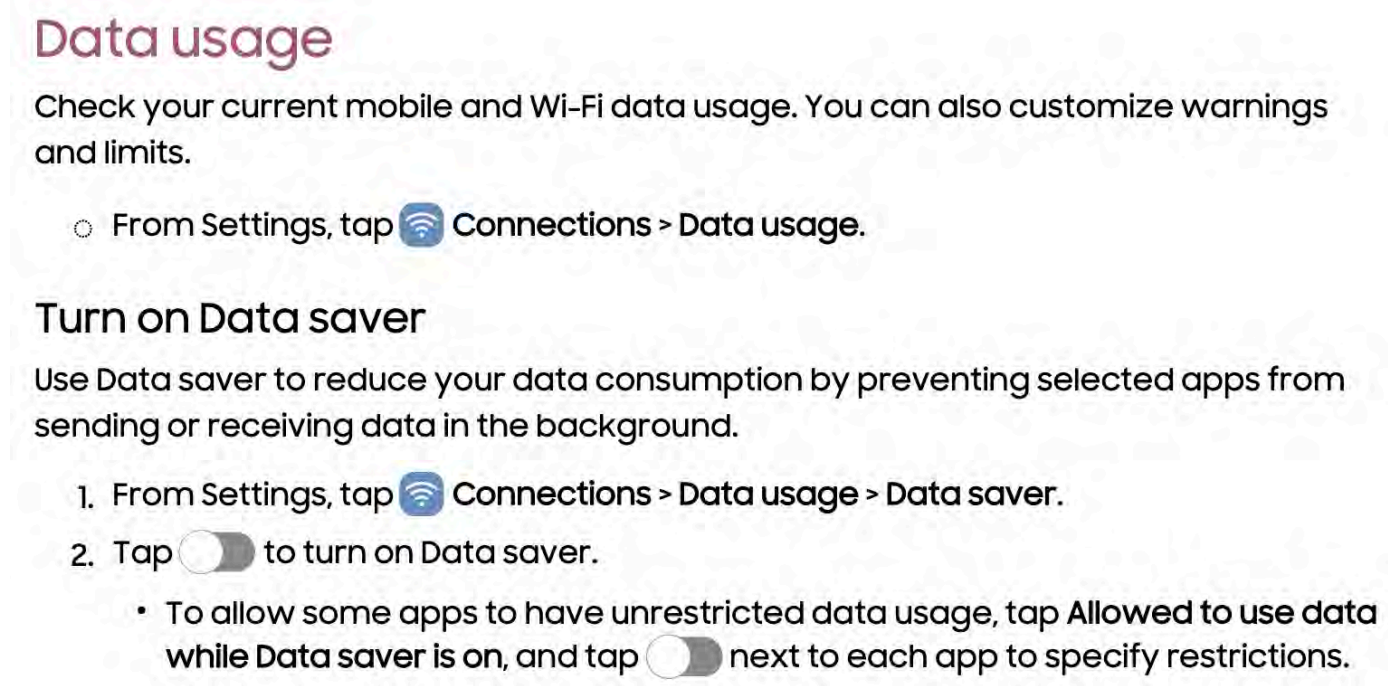
Claim	Public Documentation
	ing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks https://developer.apple.com/documentation/backgroundtasks/bgapprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocessingtask; https://developer.apple.com/documentation/backgroundtasks/bgtask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate; https://developer.apple.com/documentation/uikit/uiapplication/state; https://developer.apple.com/documentation/foundation/url_loading_system; https://developer.apple.com/documentation/foundation/urlsession; https://developer.apple.com/documentation/devicemanagement/mail; https://developer.apple.com/documentation/security/secure_transport/using_the_secure_socket_layer_for_network_communication; https://developer.apple.com/documentation/networkextension/personal_vpn; https://developer.apple.com/documentation/foundation/nsproxy; https://developer.apple.com/documentation/messages; https://developer.apple.com/documentation/avfoundation/avplayer; https://developer.apple.com/documentation/avfoundation/media_playback/configuring_your_app_for_media_playback; https://developer.apple.com/videos/play/wwdc2019/707/; https://developer.apple.com/videos/play/wwdc2020/10063:

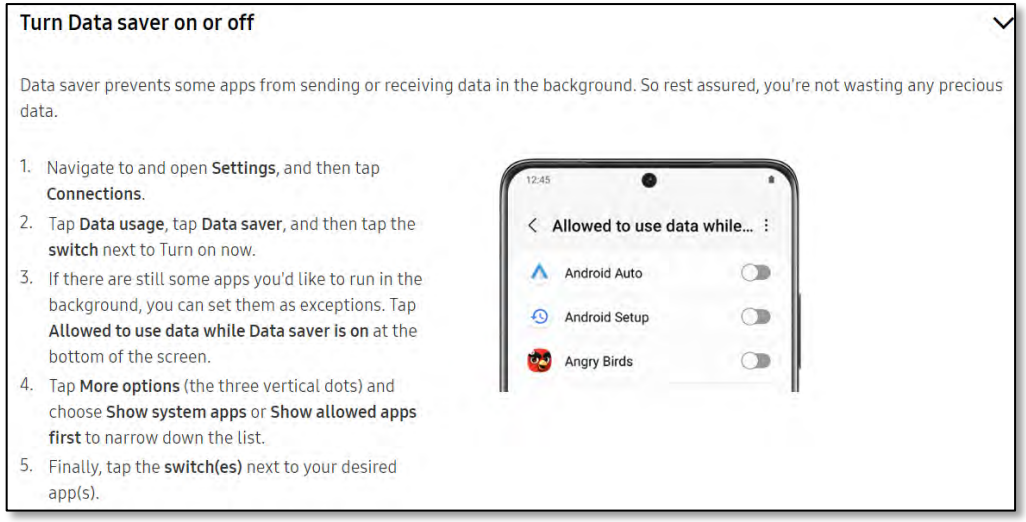
Claim	Public Documentation

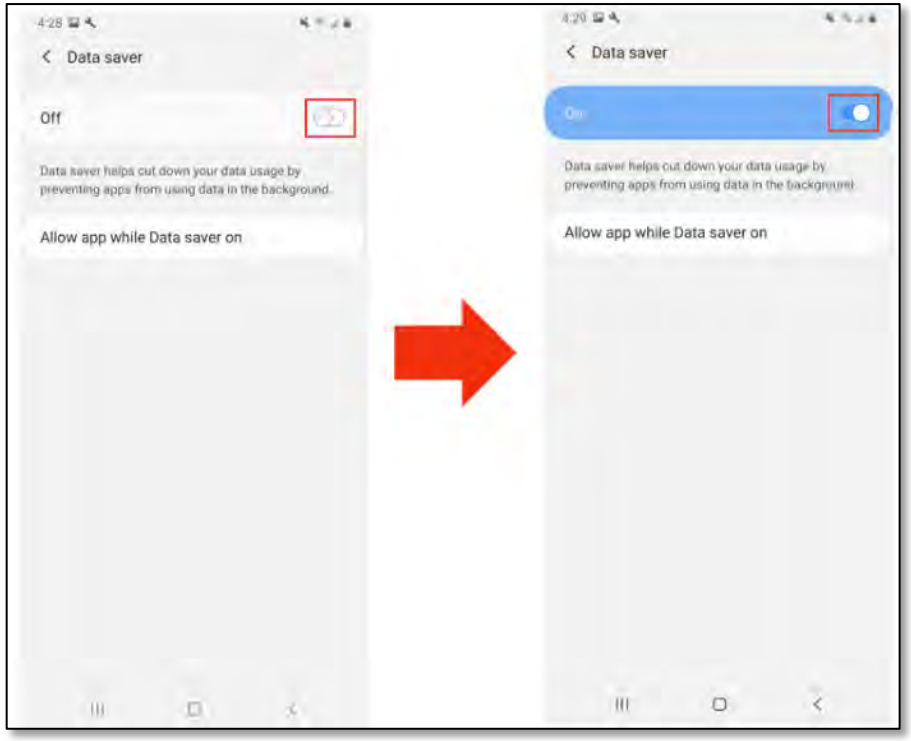
Claim	Public Documentation
	 ; *see also* exemplary screen shots below:

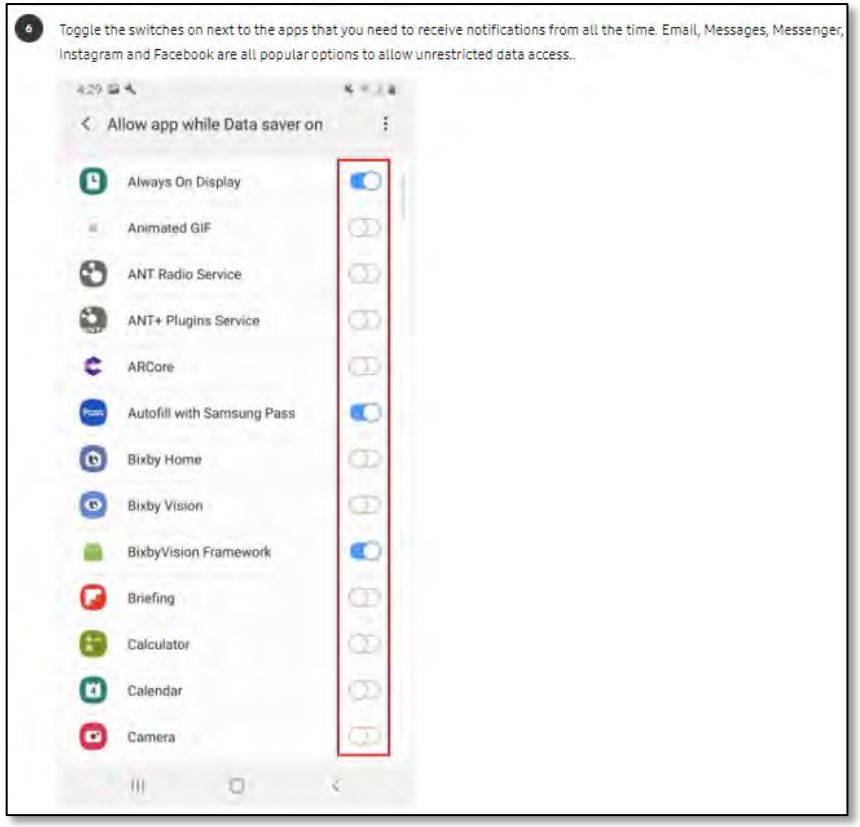

8:03
33
Back
Background App Refresh
Off
Wi-Fi
Wi-Fi & Cellular Data

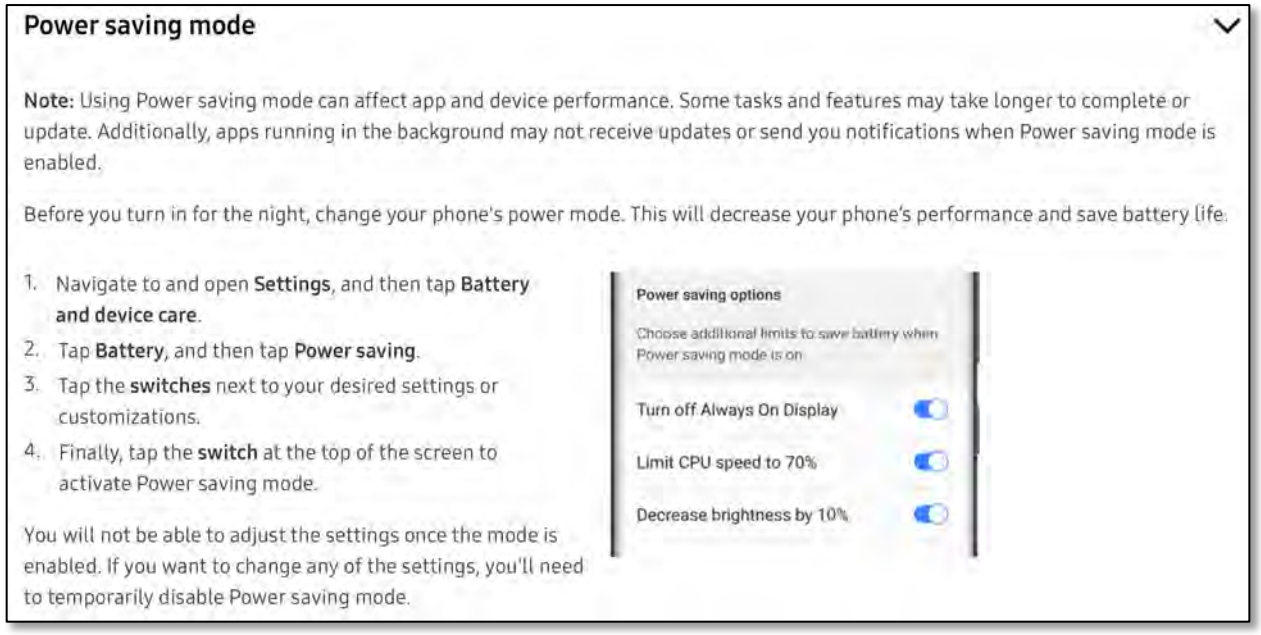
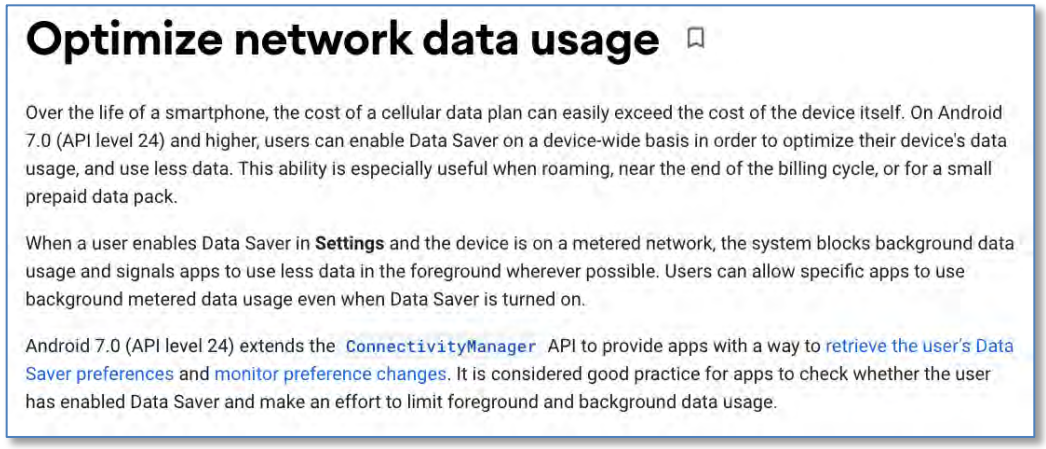
Claim	Public Documentation
	 See also, e.g., https://www.t-mobile.com/cell-phone-plans; https://www.t-mobile.com/cell-phone-plans/affordable-data-plans; https://www.t-mobile.com/business?INTNAV=tNav%3ABusiness; https://prepaid.t-mobile.com; https://www.t-mobile.com/cell-phone-plans/international-roaming-plans; https://www.t-mobile.com/support/coverage/domestic-roaming-data; https://www.t-mobile.com/customers/unlimited-roaming-sms-data.
[1c] determine whether the service usage activity comprises a background activity;	The Accused Instrumentalities "determine whether the service usage activity comprises a background activity." For example, Samsung Galaxy phones and tablets utilize Data Saver mode through which the device determines whether the service usage activity comprises background or foreground activity. *See, e.g.*, https://www.t-mobile.com/support/public-files/attachments/samsung/samsung-galaxy-s21-fe-5g/Samsung%20Galaxy%20S21%20FE%205G_English%20User%20Guide_FINAL2.pdf:

Claim	Public Documentation
	 ; https://www.samsung.com/us/support/answer/ANS00079018/:

Claim	Public Documentation
	 ; https://www.samsung.com/ae/support/mobile-devices/android-pie-what-is-the-data-saver-feature/:

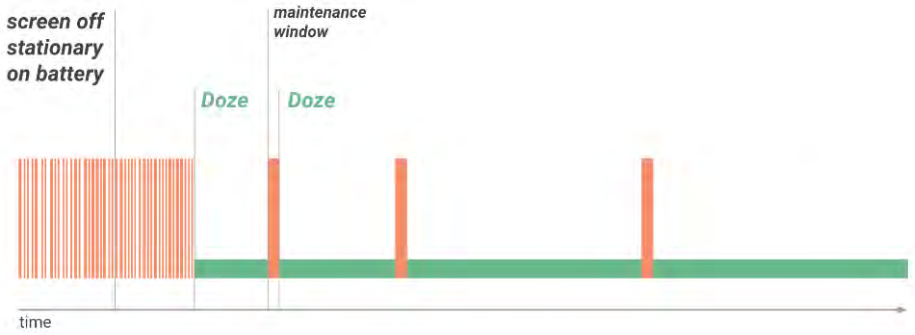
Claim	Public Documentation
	

Claim	Public Documentation
	 ; https://www.samsung.com/us/support/answer/ANS00078987/:

Claim	Public Documentation
	 ; https://developer.android.com/training/basics/network-ops/data-saver: 

Claim	Public Documentation

	Check data saver preferences
	On Android 7.0 (API level 24) and higher, apps can use the `ConnectivityManager` API to determine what data usage restrictions are being applied. The `getRestrictBackgroundStatus()` method returns one of the following values:
	`RESTRICT_BACKGROUND_STATUS_DISABLED`
	Data Saver is disabled.
	`RESTRICT_BACKGROUND_STATUS_ENABLED`
	The user has enabled Data Saver for this app. Apps should make an effort to limit data usage in the foreground and gracefully handle restrictions to background data usage.
	`RESTRICT_BACKGROUND_STATUS_WHITELISTED`
	The user has enabled Data Saver but the app is allowed to bypass it. Apps should still make an effort to limit foreground and background data usage.
	Limit data usage whenever the device is connected to a metered network, even if Data Saver is disabled or the app is allowed to bypass it. The following sample code uses `ConnectivityManager.isActiveNetworkMetered()` and `ConnectivityManager.getRestrictBackgroundStatus()` to determine how much data the app should use:
	; https://developer.android.com/training/monitoring-device-state/doze-standby:
	Optimize for Doze and App Standby
	Starting from Android 6.0 (API level 23), Android introduces two power-saving features that extend battery life for users by managing how apps behave when a device is not connected to a power source. *Doze* reduces battery consumption by deferring background CPU and network activity for apps when the device is unused for long periods of time. *App Standby* defers background network activity for apps with which the user has not recently interacted.
	While the device is in Doze, apps' access to certain battery-intensive resources is deferred until maintenance windows. The specific restrictions are listed in Power Management Restrictions.
	Doze and App Standby manage the behavior of all apps running on Android 6.0 or higher, regardless whether they are specifically targeting API level 23. To ensure the best experience for users, test your app in Doze and App Standby modes and make any necessary adjustments to your code. The sections below provide details.

Claim	Public Documentation
	Understanding Doze If a user leaves a device unplugged and stationary for a period of time, with the screen off, the device enters Doze mode. In Doze mode, the system attempts to conserve battery by restricting apps' access to network and CPU-intensive services. It also prevents apps from accessing the network and defers their jobs, syncs, and standard alarms. Periodically, the system exits Doze for a brief time to let apps complete their deferred activities. During this *maintenance window*, the system runs all pending syncs, jobs, and alarms, and lets apps access the network.  **Figure 1.** Doze provides a recurring maintenance window for apps to use the network and handle pending activities. At the conclusion of each maintenance window, the system again enters Doze, suspending network access and deferring jobs, syncs, and alarms. Over time, the system schedules maintenance windows less and less frequently, helping to reduce battery consumption in cases of longer-term inactivity when the device is not connected to a charger. As soon as the user wakes the device by moving it, turning on the screen, or connecting a charger, the system exits Doze and all apps return to normal activity. The Doze restriction on network access is also likely to affect your app, especially if the app relies on real-time messages such as tickles or notifications. If your app requires a persistent connection to the network to receive messages, you should use Firebase Cloud Messaging (FCM) if possible. ; https://developer.android.com/topic/performance/appstandby:

App Standby Buckets

Android 9 (API level 28) and higher support **App Standby Buckets**. App Standby Buckets help the system prioritize apps' requests for resources based on how recently and how frequently the apps are used. Based on app usage patterns, each app is placed in one of five priority **buckets**. The system limits the device resources available to each app based on which bucket the app is in.

Priority buckets

The system dynamically assigns each app to a priority bucket, reassigning the apps as needed. The system may rely on a preloaded app that uses machine learning to determine how likely each app is to be used, and assigns apps to the appropriate buckets. If the system app is not present on a device, the system defaults to sorting apps based on how recently they were used. More active apps are assigned to buckets that give the apps higher priority, making more system resources available to the app. In particular, the bucket determines how frequently the app's jobs run, and how often the app can trigger alarms. These restrictions apply only while the device is on battery power; the system does not impose these restrictions on apps while the device is charging.

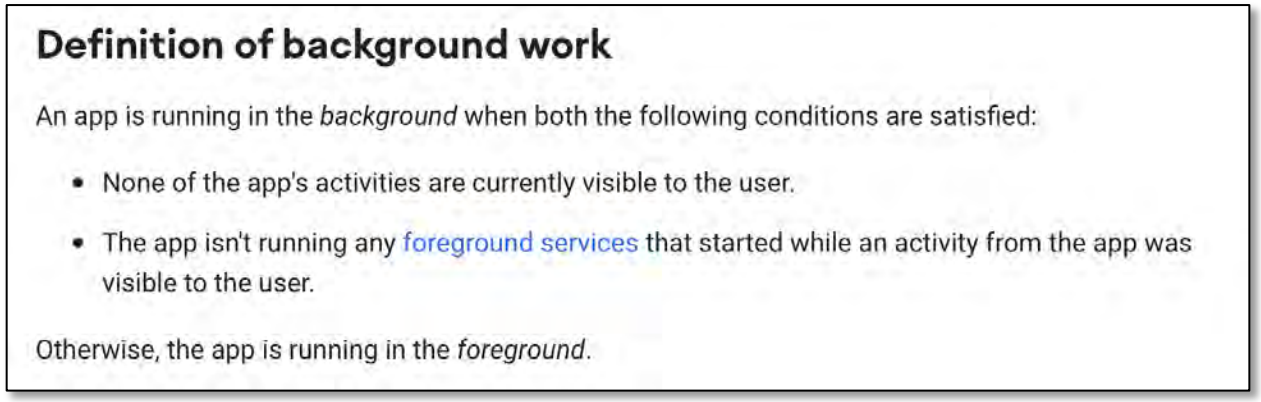
Note: Every manufacturer can set their own criteria for how non-active apps are assigned to buckets. You should not try to influence which bucket your app is assigned to. Instead, focus on making sure your app behaves well in whatever bucket it might be in. Your app can find out what bucket it's currently in by calling `UsageStatsManager.getAppStandbyBucket()`.

The buckets are:

1. Active: App is currently being used or was very recently used.
2. Working set: App is in regular use.
3. Frequent: App is often used, but not every day.
4. Rare: App is not frequently used.
5. Restricted: App consumes a great deal of system resources, or may exhibit undesirable behavior.

In addition, there's a special **never** bucket for apps that have been installed but have never been run. The system imposes severe restrictions on these apps.

Claim	Public Documentation
	; https://developer.android.com/topic/performance/power/power-details; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler; https://developer.android.com/guide/background/persistent; https://developer.android.com/guide/components/activities/activity-lifecycle; https://developer.android.com/guide/components/activities/process-lifecycle: 1. A **foreground process** is one that is required for what the user is currently doing. Various application components can cause its containing process to be considered foreground in different ways. A process is considered to be in the foreground if any of the following conditions hold: • It is running an `Activity` at the top of the screen that the user is interacting with (its `onResume()` method has been called). • It has a `BroadcastReceiver` that is currently running (its `BroadcastReceiver.onReceive()` method is executing). • It has a `Service` that is currently executing code in one of its callbacks (`Service.onCreate()`, `Service.onStart()`, or `Service.onDestroy()`). There will only ever be a few such processes in the system, and these will only be killed as a last resort if memory is so low that not even these processes can continue to run. Generally, at this point, the device has reached a memory paging state, so this action is required in order to keep the user interface responsive. ; https://developer.android.com/guide/background:

Claim	Public Documentation
	 ; https://developer.android.com/guide/components/services;

Types of Services

These are the three different types of services:

Foreground

A foreground service performs some operation that is noticeable to the user. For example, an audio app would use a foreground service to play an audio track. Foreground services must display a Notification. Foreground services continue running even when the user isn't interacting with the app.

When you use a foreground service, you must display a notification so that users are actively aware that the service is running. This notification cannot be dismissed unless the service is either stopped or removed from the foreground.

Learn more about how to configure foreground services in your app.

> **Note:** The WorkManager API offers a flexible way of scheduling tasks, and is able to run these jobs as foreground services if needed. In many cases, using WorkManager is preferable to using foreground services directly.

Background

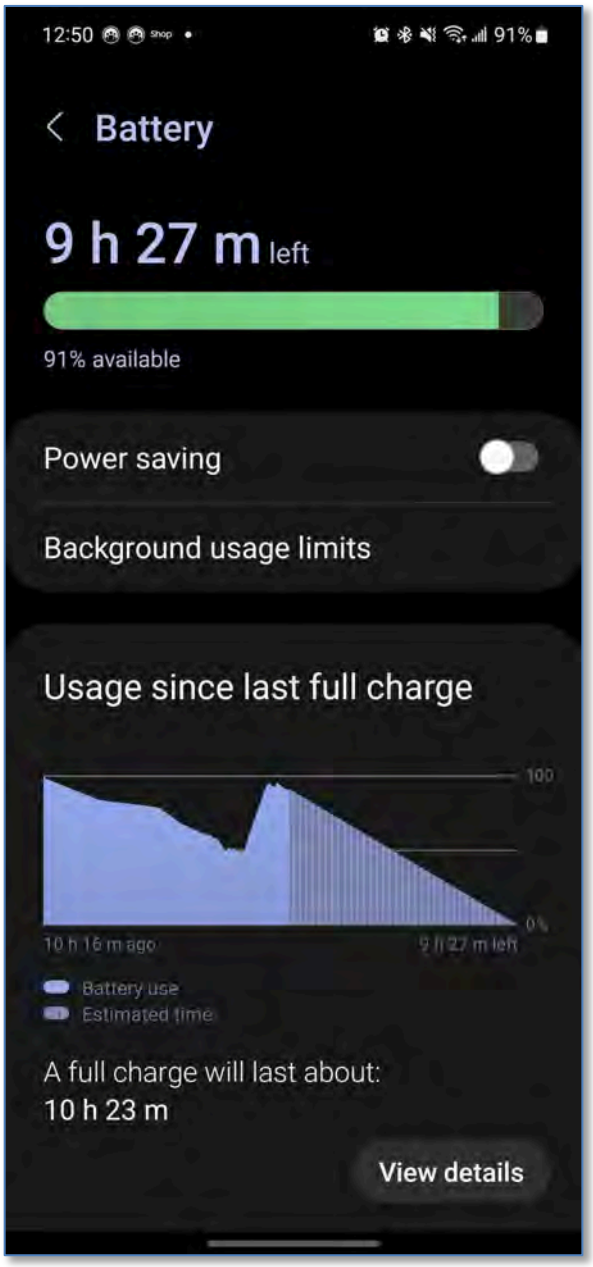
A background service performs an operation that isn't directly noticed by the user. For example, if an app used a service to compact its storage, that would usually be a background service.

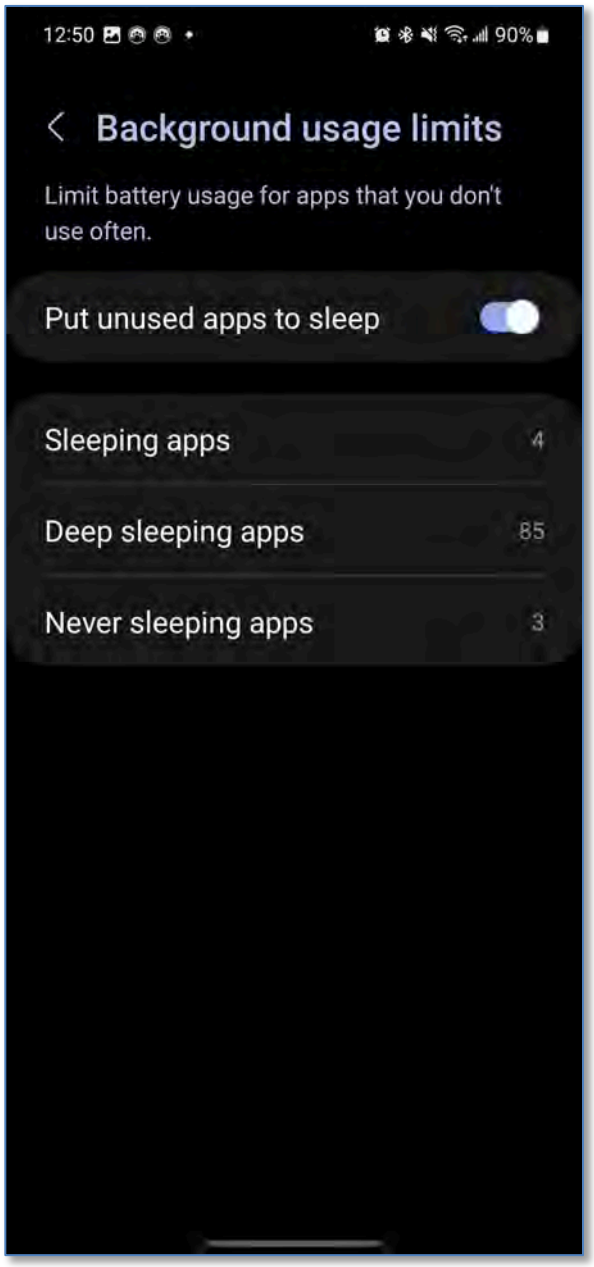
> **Note:** If your app targets API level 26 or higher, the system imposes restrictions on running background services when the app itself isn't in the foreground. In most situations, for example, you shouldn't access location information from the background. Instead, schedule tasks using WorkManager.

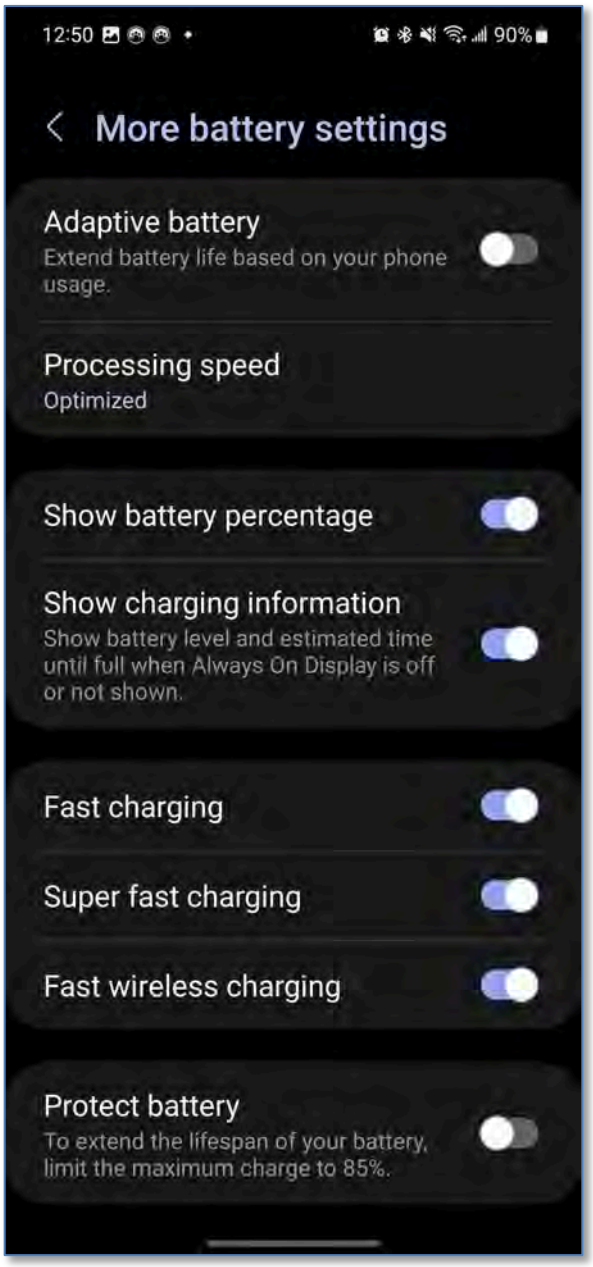
Bound

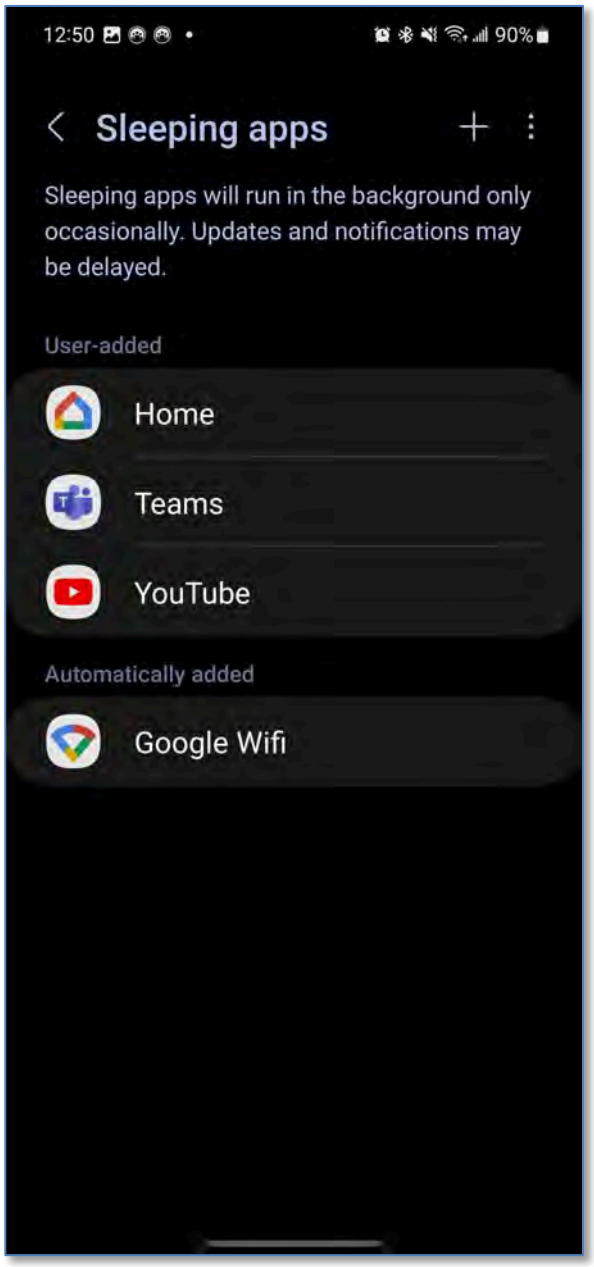
A service is *bound* when an application component binds to it by calling `bindService()`. A bound service offers a client-server interface that allows components to interact with the service, send requests, receive results, and even do so across processes with interprocess communication (IPC). A bound service runs only as long as another application component is bound to it. Multiple components can bind to the service at once, but when all of them unbind, the service is destroyed.

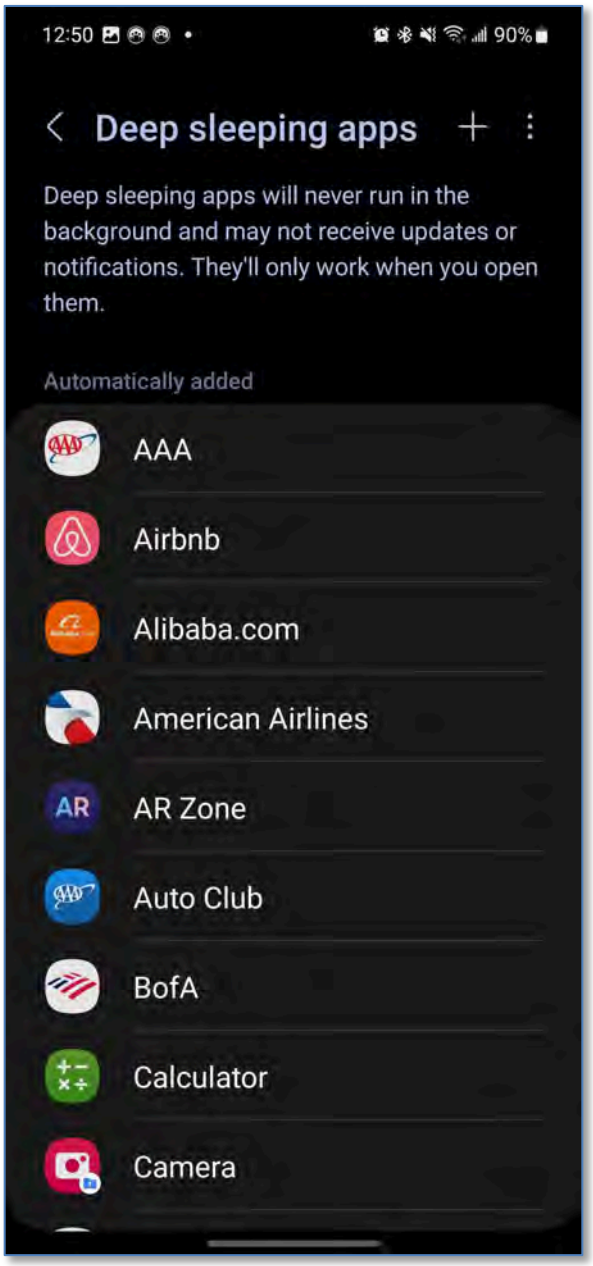
Claim	Public Documentation
	; https://developer.android.com/guide/components/activities/intro-activities; *see also* the exemplary screen-shots below:

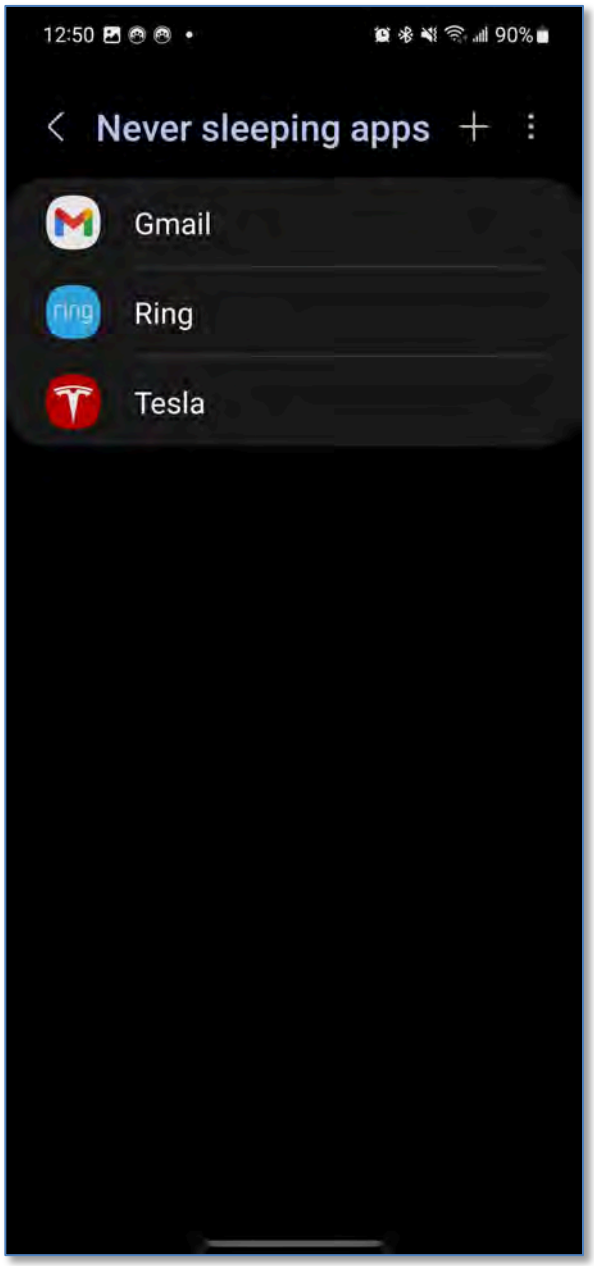

12:50
91%
Battery
9 h 27 m left
91% available
Power saving
Background usage limits
Usage since last full charge
100
0%
10 h 16 m ago
9 h 27 m left
Battery use
Estimated time
A full charge will last about:
10 h 23 m
View details

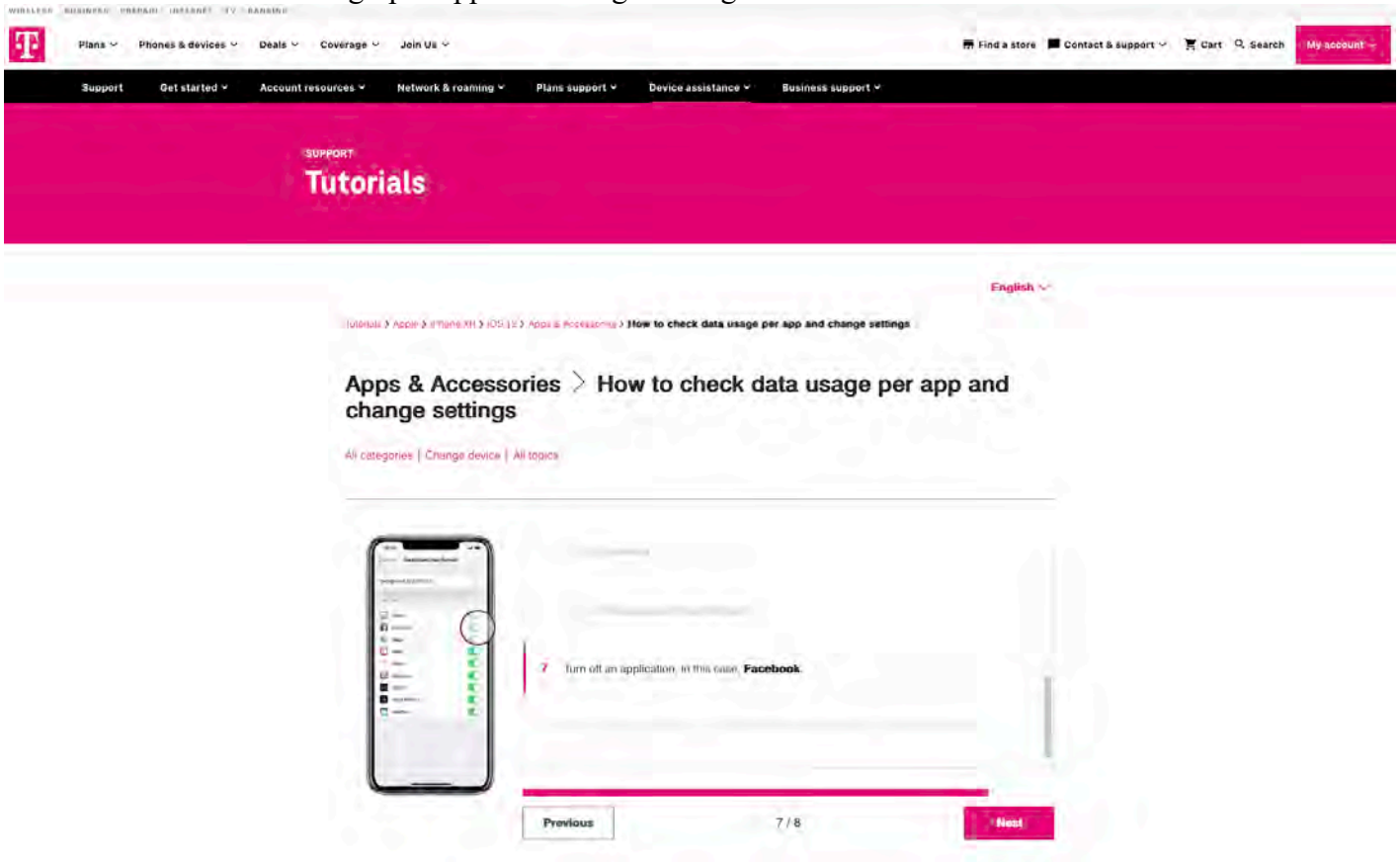

12:50
90%
Background usage limits
Limit battery usage for apps that you don't use often.
Put unused apps to sleep
Sleeping apps 4
Deep sleeping apps 85
Never sleeping apps 3


12:50
90%
More battery settings
Adaptive battery
Extend battery life based on your phone usage.
Processing speed
Optimized
Show battery percentage
Show charging information
Show battery level and estimated time until full when Always On Display is off or not shown.
Fast charging
Super fast charging
Fast wireless charging
Protect battery
To extend the lifespan of your battery, limit the maximum charge to 85%.


12:50
90%
Sleeping apps
Sleeping apps will run in the background only occasionally. Updates and notifications may be delayed.
User-added
Home
Teams
YouTube
Automatically added
Google Wifi


12:50
90%
Deep sleeping apps
Deep sleeping apps will never run in the background and may not receive updates or notifications. They'll only work when you open them.
Automatically added
AAA
Airbnb
Alibaba.com
American Airlines
AR Zone
Auto Club
BofA
Calculator
Camera


12:50
90%
Never sleeping apps
Gmail
Ring
Tesla

Claim	Public Documentation
	See also e.g., https://www.t-mobile.com/support/tutorials/device/apple/iphone-xr/topic/apps-amp-accessories/how-to-check-data-usage-per-app-and-change-settings/7  ; https://support.apple.com/en-us/HT202070:

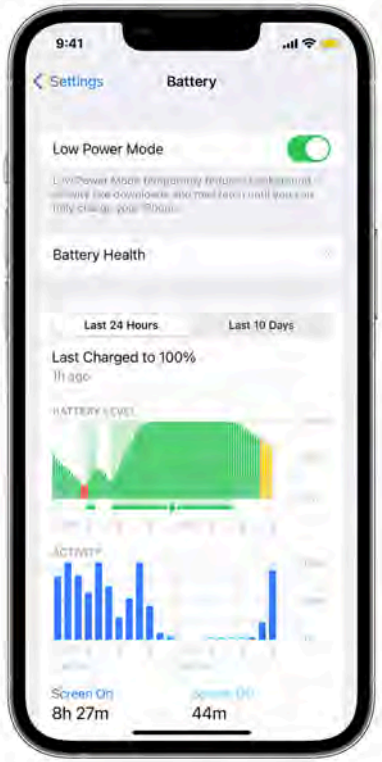
Claim	Public Documentation
	 https://support.apple.com/en-us/HT205234:

Use Low Power Mode to save battery life on your iPhone or iPad

Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.



Low Power Mode reduces or affects these features:

- 5G (except for video streaming) on iPhone 12 and iPhone 13 models[1]
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display[2]
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.

1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

Claim	Public Documentation
	https://www.apple.com/batteries/maximizing-performance/: **View Battery Usage information** With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery. Here are the messages you may see listed below the apps you've been using: **Background Activity.** This indicates that the battery was used by the app while it was in the background — that is, while you were using another app. • To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely. • If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data. ; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate:

Claim	Public Documentation
	Instance Property **applicationState** The app's current state, or that of its most active scene. iOS 4.0+ iPadOS 4.0+ Mac Catalyst 13.1+ tvOS 9.0+ visionOS 1.0+ Beta `var applicationState: UIApplication.State { get }` **Discussion** The behavior of this property depends on whether your app is scene-based. In a scene-based app, this property takes the value of the most active scene, which it determines from each scene's `activationState` property. A scene-based app launches in the background state, and transitions between its states as scenes connect, change their states, and disconnect. For scene-based apps, use `UISceneDelegate` to respond to changes in an individual scene's life cycle. In a sceneless app, the property's value is always the app's current state. The app is inactive at launch, and then is generally in either an active or background state. The app may become inactive for a short period — for example, when transitioning between active and background states, when the system presents an alert in front of it, or when the system displays the application switcher. For sceneless apps, use `UIApplicationDelegate` to respond to the app's life cycle changes. ; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/;

Claim	Public Documentation
	https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks https://developer.apple.com/documentation/backgroundtasks/bgapprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocessingtask; https://developer.apple.com/documentation/backgroundtasks/bgtask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_foreground/; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate; https://developer.apple.com/documentation/uikit/uiapplication/state; https://developer.apple.com/documentation/foundation/url_loading_system; https://developer.apple.com/documentation/foundation/urlsession; https://developer.apple.com/documentation/avfoundation/avplayer; https://developer.apple.com/documentation/avfoundation/media_playback/configuring_your_app_for_media_playback; https://developer.apple.com/videos/play/wwdc2019/707/; https://developer.apple.com/videos/play/wwdc2020/10063:

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	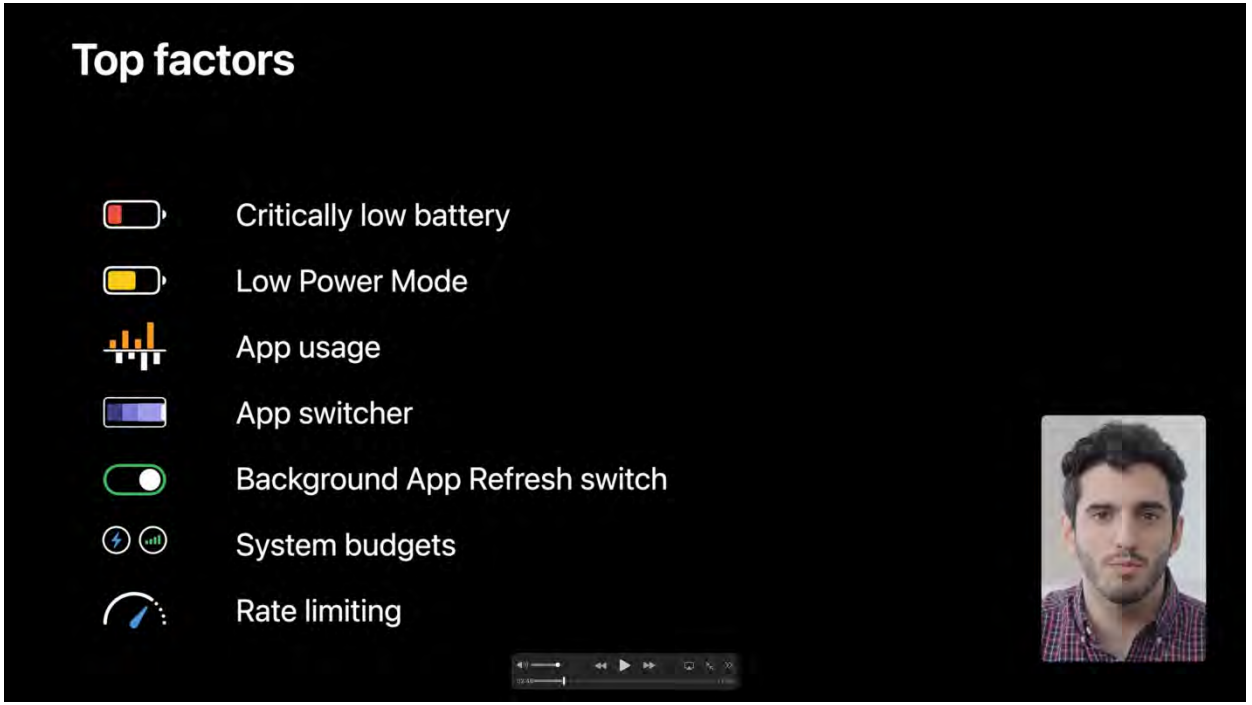

Claim	Public Documentation
[1d] determine at least an aspect of a policy based on a user input obtained through a user interface of the wireless end-user device or based on information from a network element, the policy to be applied if the service usage activity is the background activity, the policy at least for controlling the service usage activity;	The Accused Instrumentalities "determine at least an aspect of a policy based on a user input obtained through a user interface of the wireless end-user device or based on information from a network element, the policy to be applied if the service usage activity is the background activity, the policy at least for controlling the service usage activity." For example, Samsung devices include an interface which allow users to specify multiple aspects of policies based on user input in various settings (e.g., enabling/disabling Data Saver, Power Saver, Adaptive Battery features, as well as enabling/disabling policies for specific applications) for controlling service usage activities, and Apple devices include an interface which allow users to specify multiple aspects of policies based on user input in various settings (e.g., enabling/disabling Background App Refresh and Low Power Mode as well as enabling/disabling policies for specific applications) controlling service usage activities. *See, e.g.*, https://www.t-mobile.com/support/public-files/attachments/samsung/samsung-galaxy-s21-fe-5g/Samsung%20Galaxy%20S21%20FE%205G_English%20User%20Guide_FINAL2.pdf:

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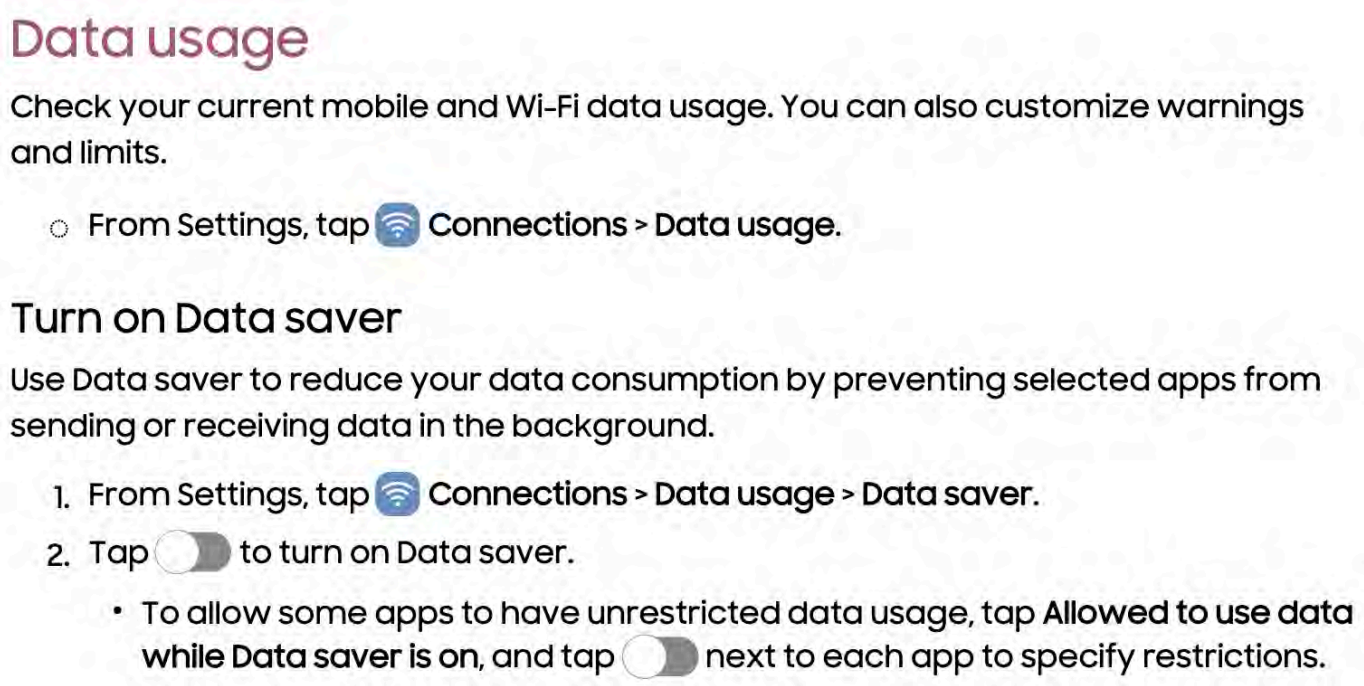
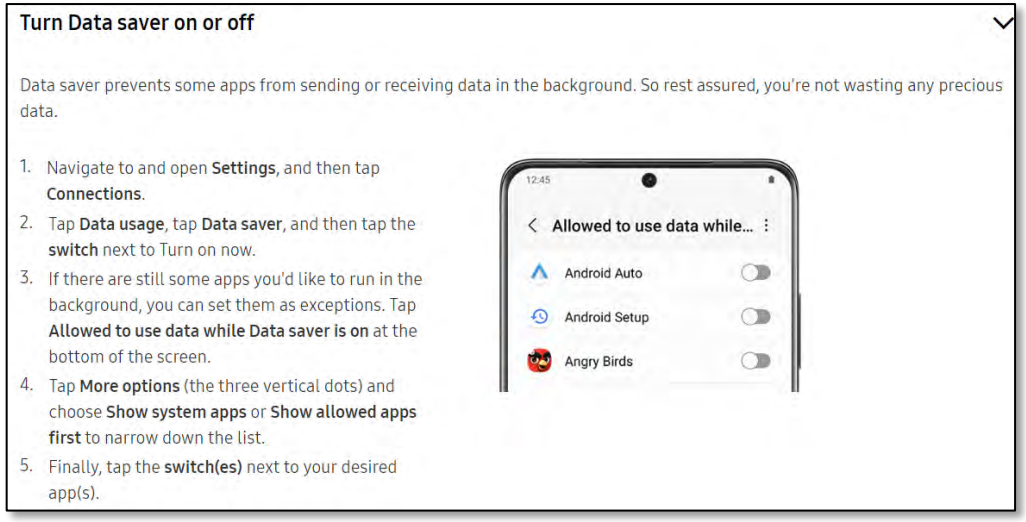
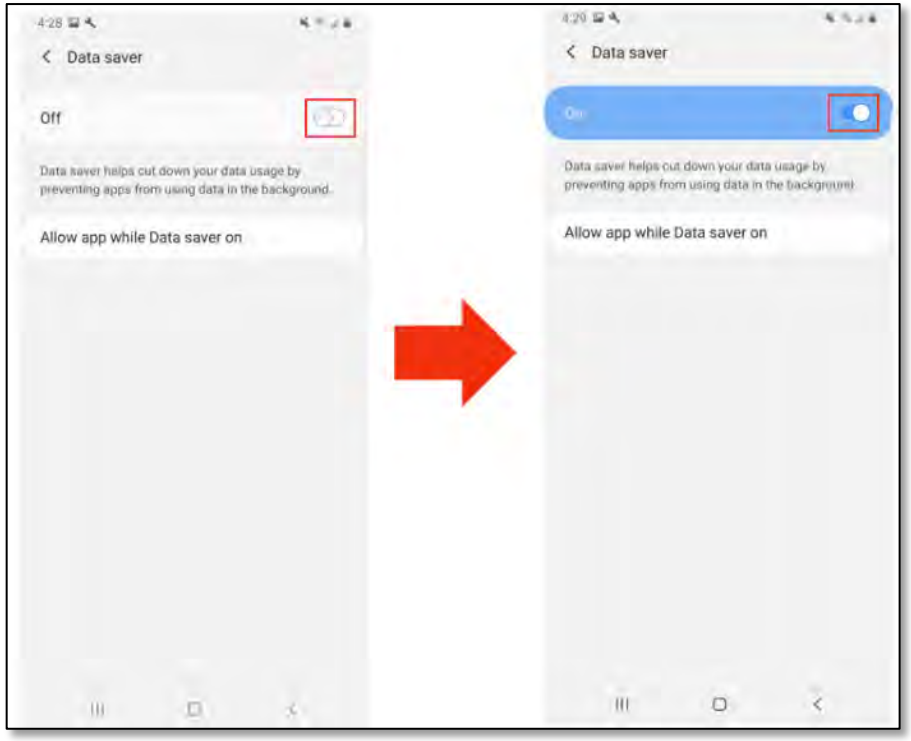
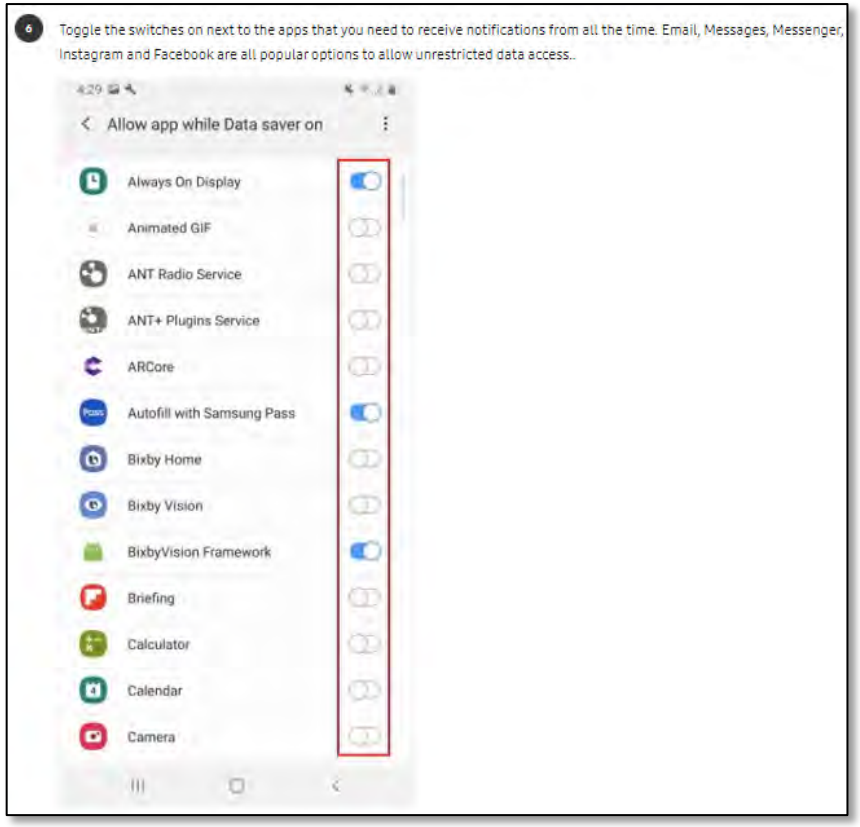
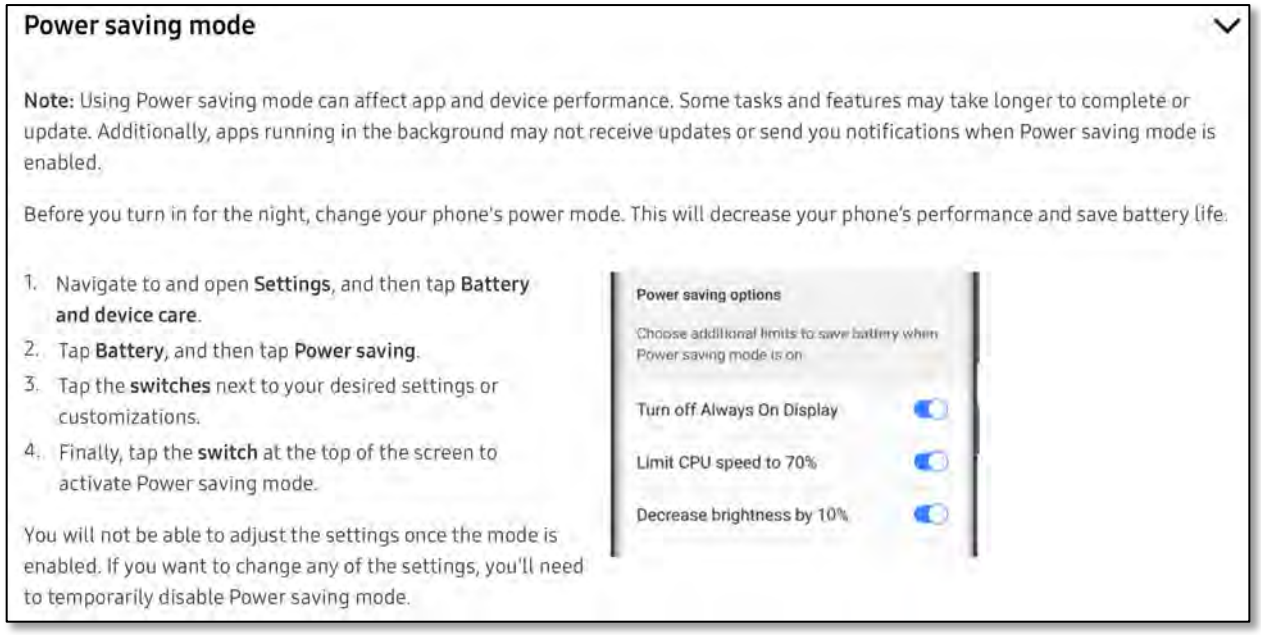
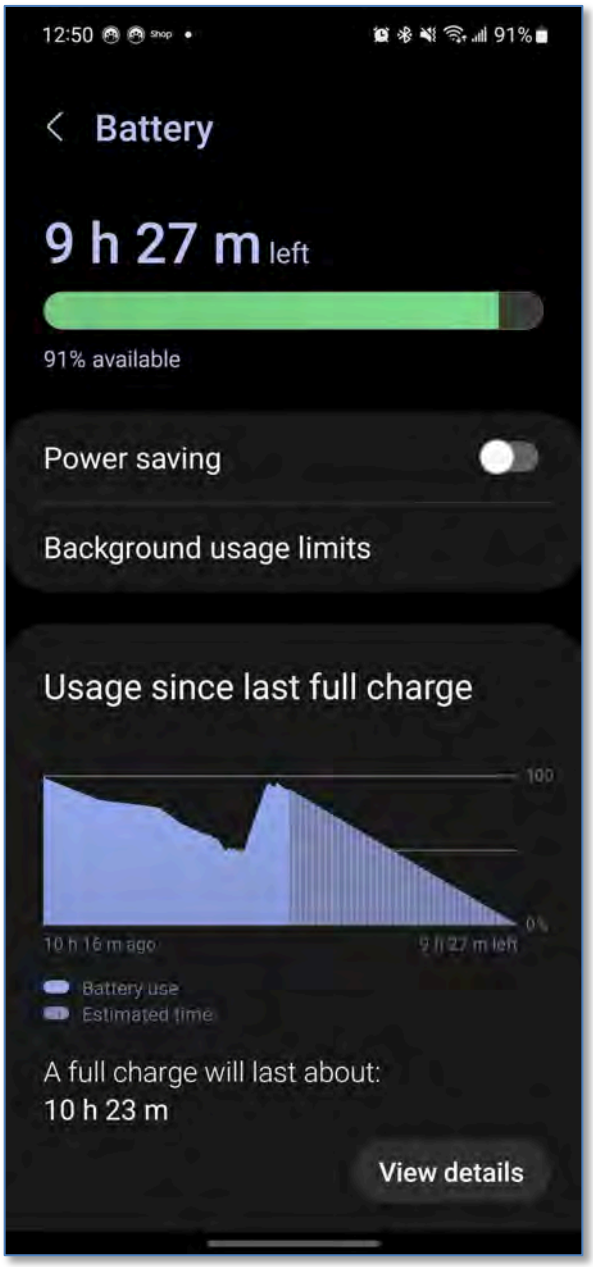
	 ; https://www.samsung.com/us/support/answer/ANS00079018/:

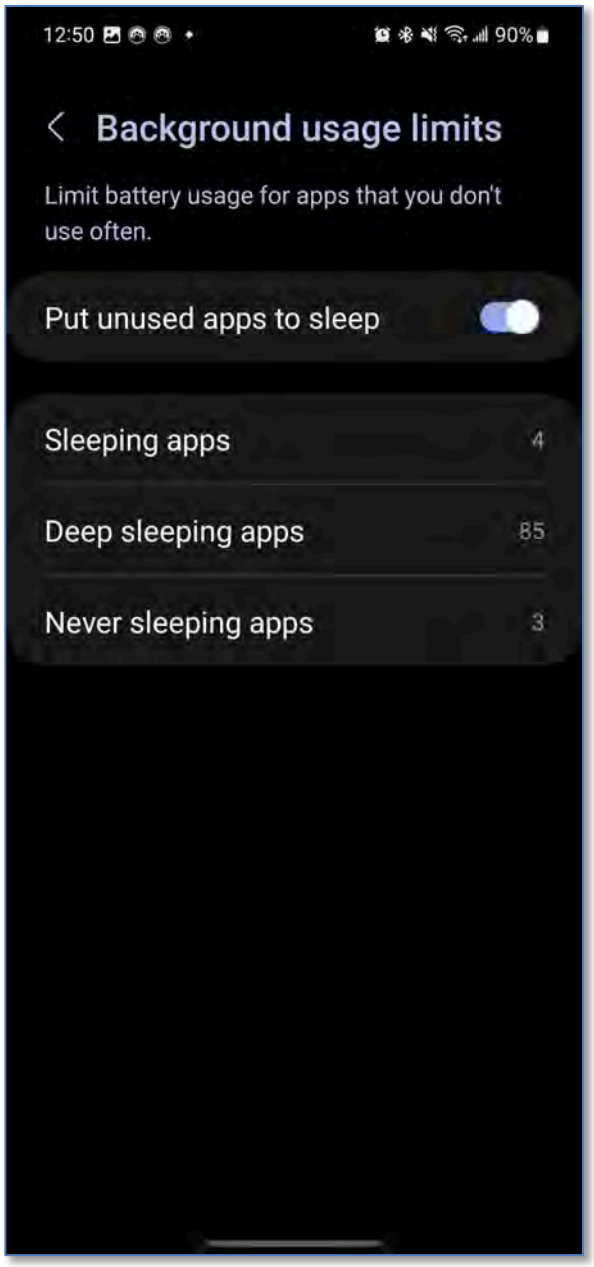
Claim	Public Documentation
	 ; https://www.samsung.com/ae/support/mobile-devices/android-pie-what-is-the-data-saver-feature/:

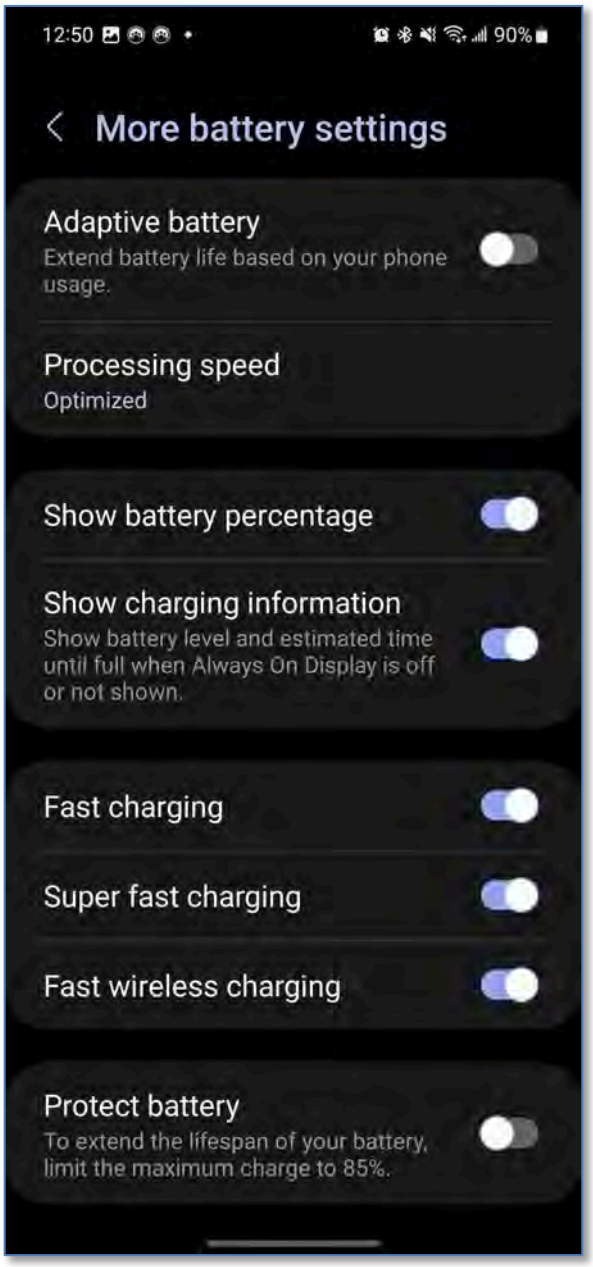
Claim	Public Documentation
	

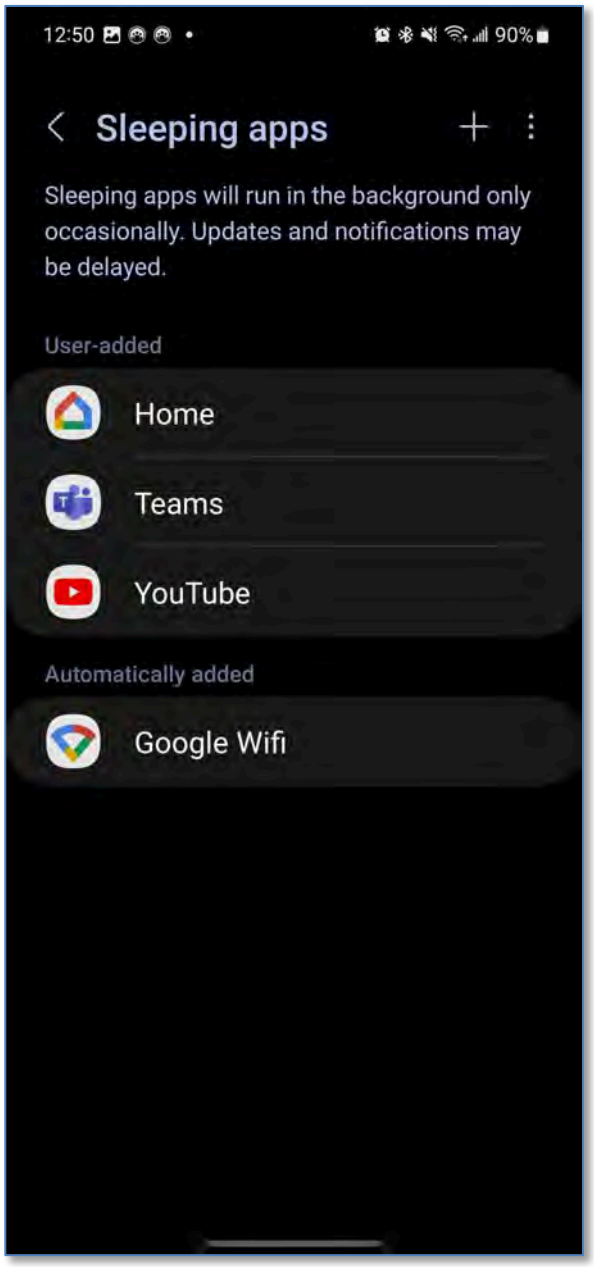
Claim	Public Documentation
	 ; https://www.samsung.com/us/support/answer/ANS00078987/:

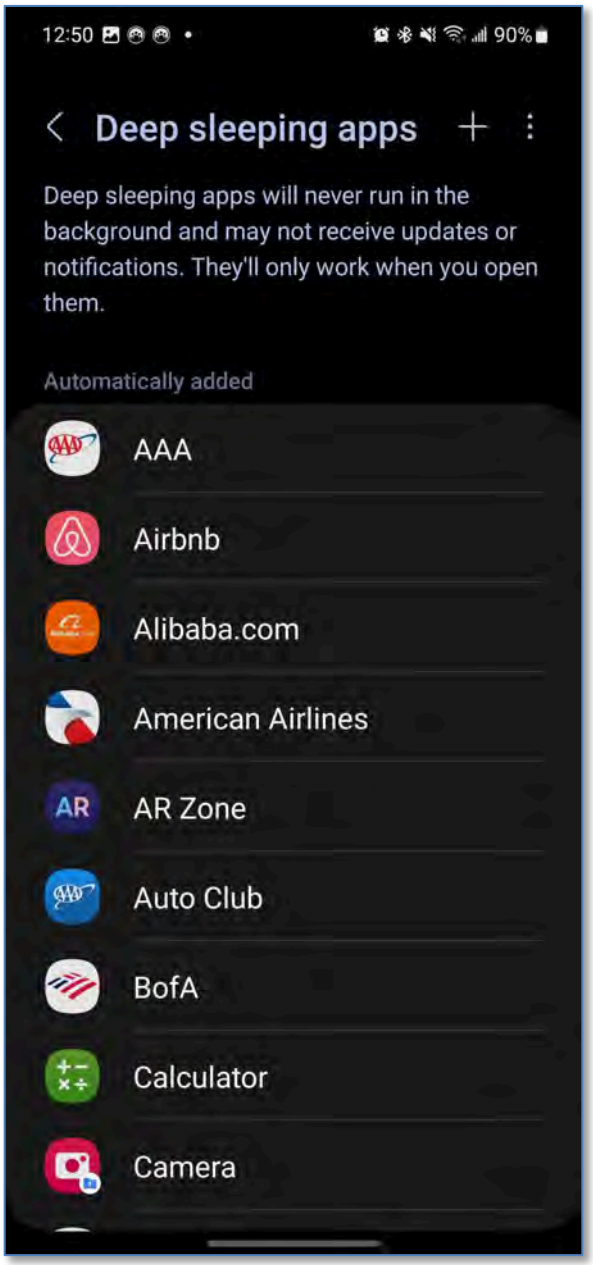
Claim	Public Documentation
	 *see also* the exemplary screenshots below:

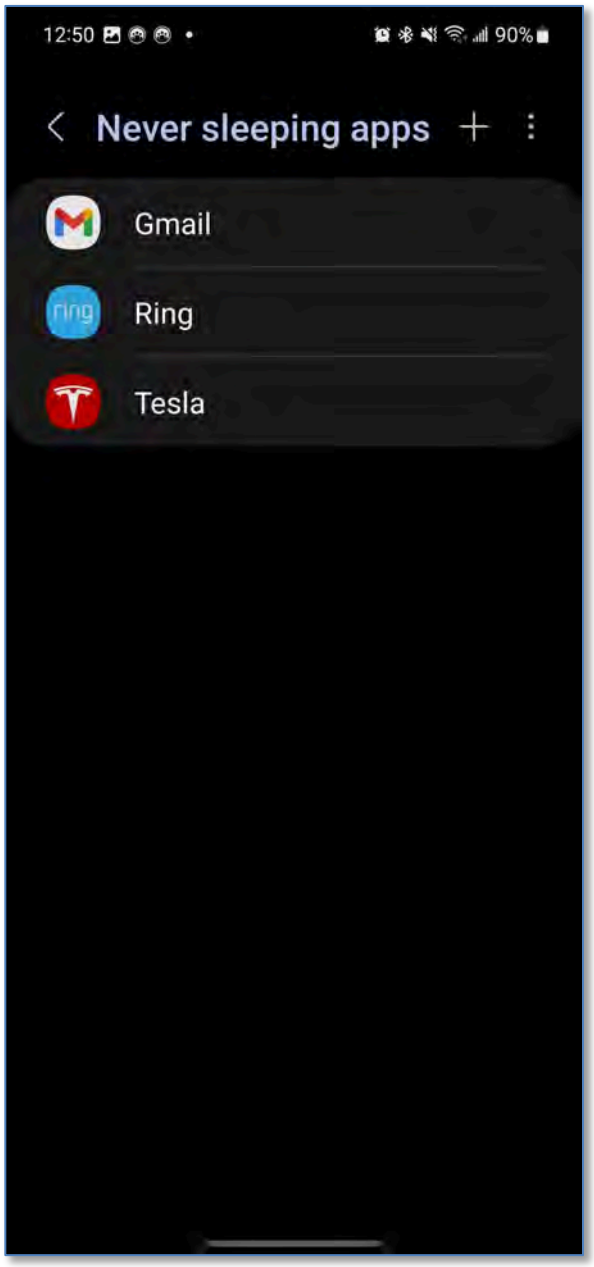

12:50
91%
Battery
9 h 27 m left
91% available
Power saving
Background usage limits
Usage since last full charge
100
0%
10 h 16 m ago
9 h 27 m left
Battery use
Estimated time
A full charge will last about:
10 h 23 m
View details

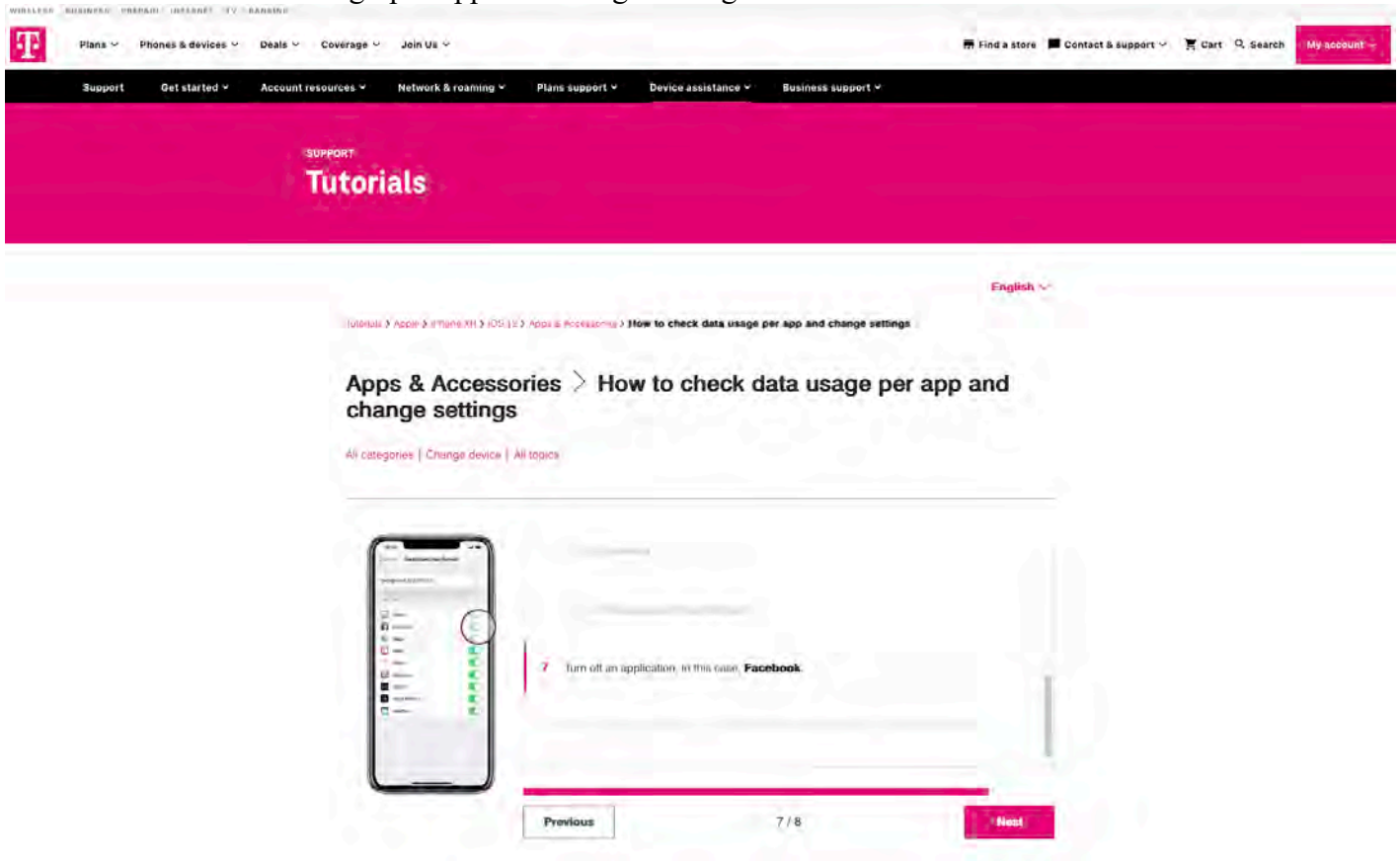

12:50
90%
Background usage limits
Limit battery usage for apps that you don't use often.
Put unused apps to sleep
Sleeping apps 4
Deep sleeping apps 85
Never sleeping apps 3


12:50
90%
More battery settings
Adaptive battery
Extend battery life based on your phone usage.
Processing speed
Optimized
Show battery percentage
Show charging information
Show battery level and estimated time until full when Always On Display is off or not shown.
Fast charging
Super fast charging
Fast wireless charging
Protect battery
To extend the lifespan of your battery, limit the maximum charge to 85%.


12:50
90%
Sleeping apps
Sleeping apps will run in the background only occasionally. Updates and notifications may be delayed.
User-added
Home
Teams
YouTube
Automatically added
Google Wifi


12:50
90%
Deep sleeping apps
Deep sleeping apps will never run in the background and may not receive updates or notifications. They'll only work when you open them.
Automatically added
AAA
Airbnb
Alibaba.com
American Airlines
AR Zone
Auto Club
BofA
Calculator
Camera


12:50
90%
Never sleeping apps
Gmail
Ring
Tesla

Claim	Public Documentation
	See also, e.g., https://www.t-mobile.com/support/tutorials/device/apple/iphone-xr/topic/apps-amp-accessories/how-to-check-data-usage-per-app-and-change-settings/7  ; https://support.apple.com/en-us/HT202070:

Claim	Public Documentation
	 https://support.apple.com/en-us/HT205234:

Use Low Power Mode to save battery life on your iPhone or iPad

Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

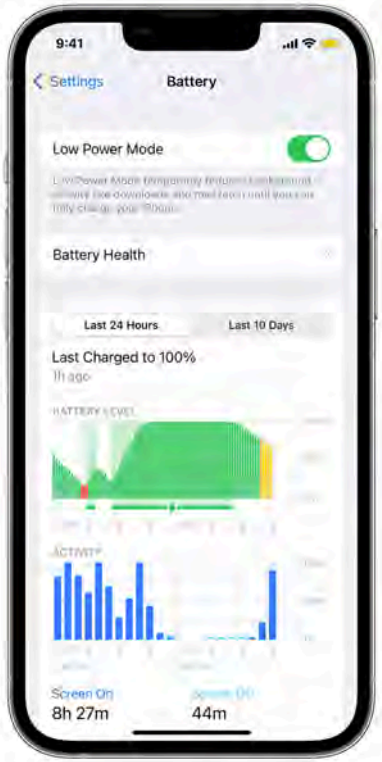
To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.

Low Power Mode reduces or affects these features:

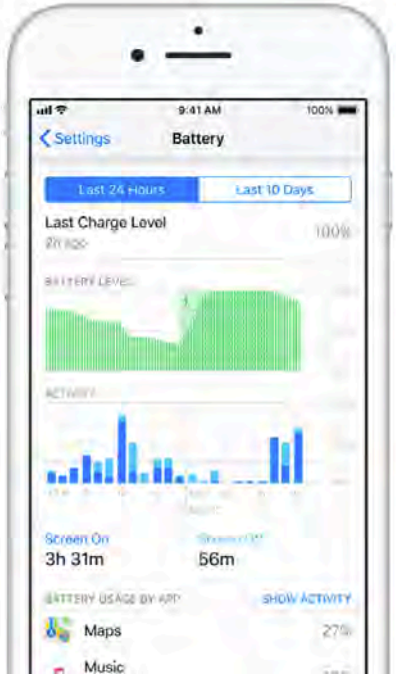
- 5G (except for video streaming) on iPhone 12 and iPhone 13 models[1]
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display[2]
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

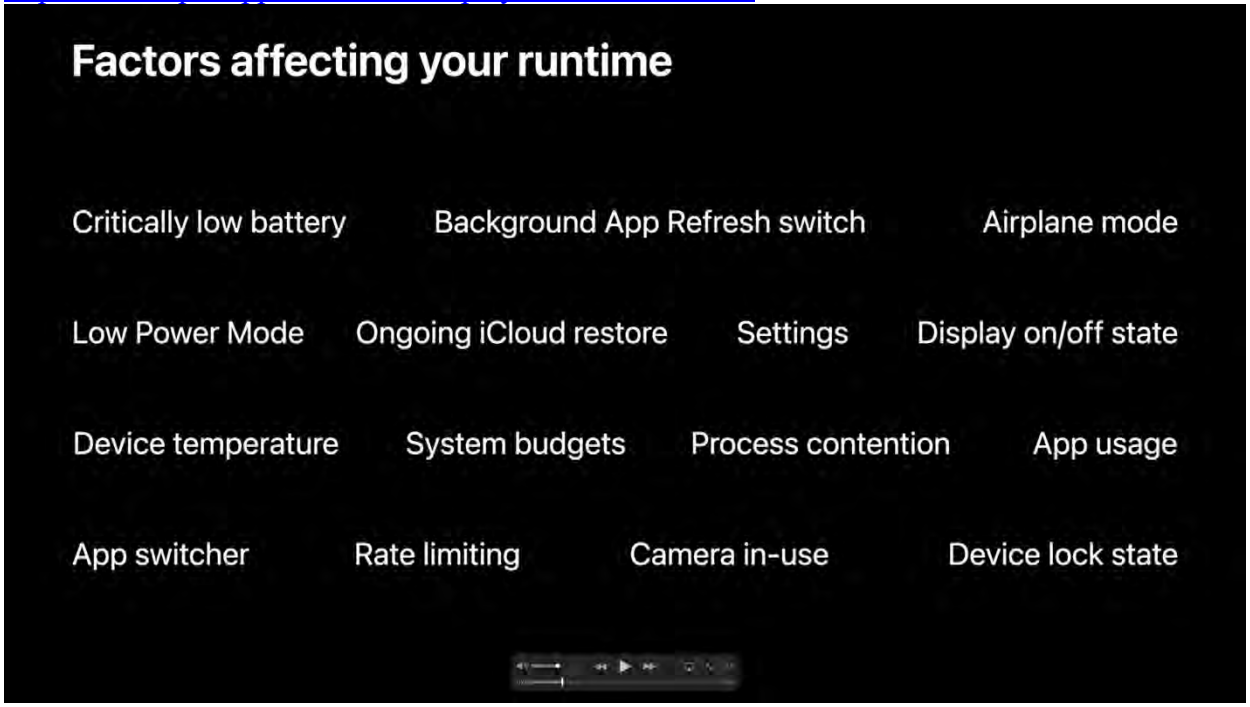
When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.



1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

Claim	Public Documentation
	https://www.apple.com/batteries/maximizing-performance/: **View Battery Usage information** With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery. Here are the messages you may see listed below the apps you've been using: **Background Activity.** This indicates that the battery was used by the app while it was in the background — that is, while you were using another app. • To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely. • If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data.  ; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/; https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/prepar-

Claim	Public Documentation
	ing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks https://developer.apple.com/documentation/backgroundtasks/bgapprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocessingtask; https://developer.apple.com/documentation/backgroundtasks/bgtask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate; https://developer.apple.com/documentation/uikit/uiapplication/state; https://developer.apple.com/documentation/foundation/url_loading_system; https://developer.apple.com/documentation/foundation/urlsession; https://developer.apple.com/documentation/avfoundation/avplayer; https://developer.apple.com/documentation/avfoundation/media_playback/configuring_your_app_for_media_playback; https://developer.apple.com/videos/play/wwdc2019/707/; https://developer.apple.com/videos/play/wwdc2020/10063: 

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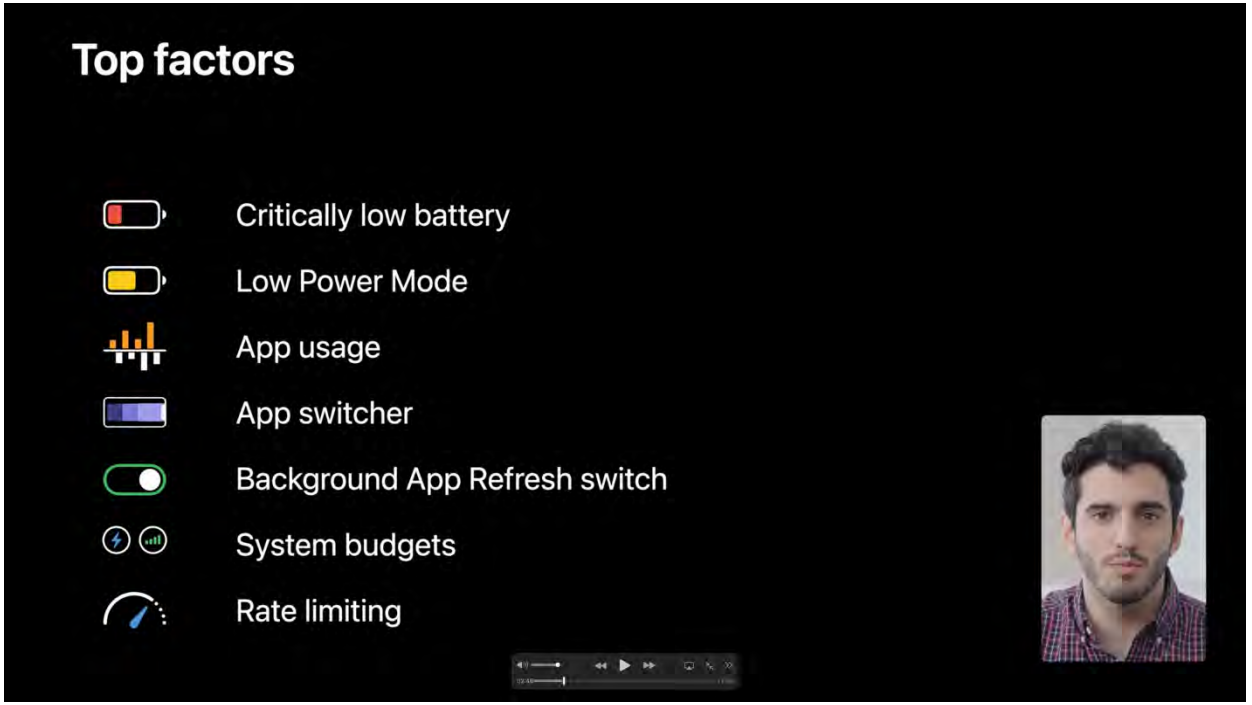
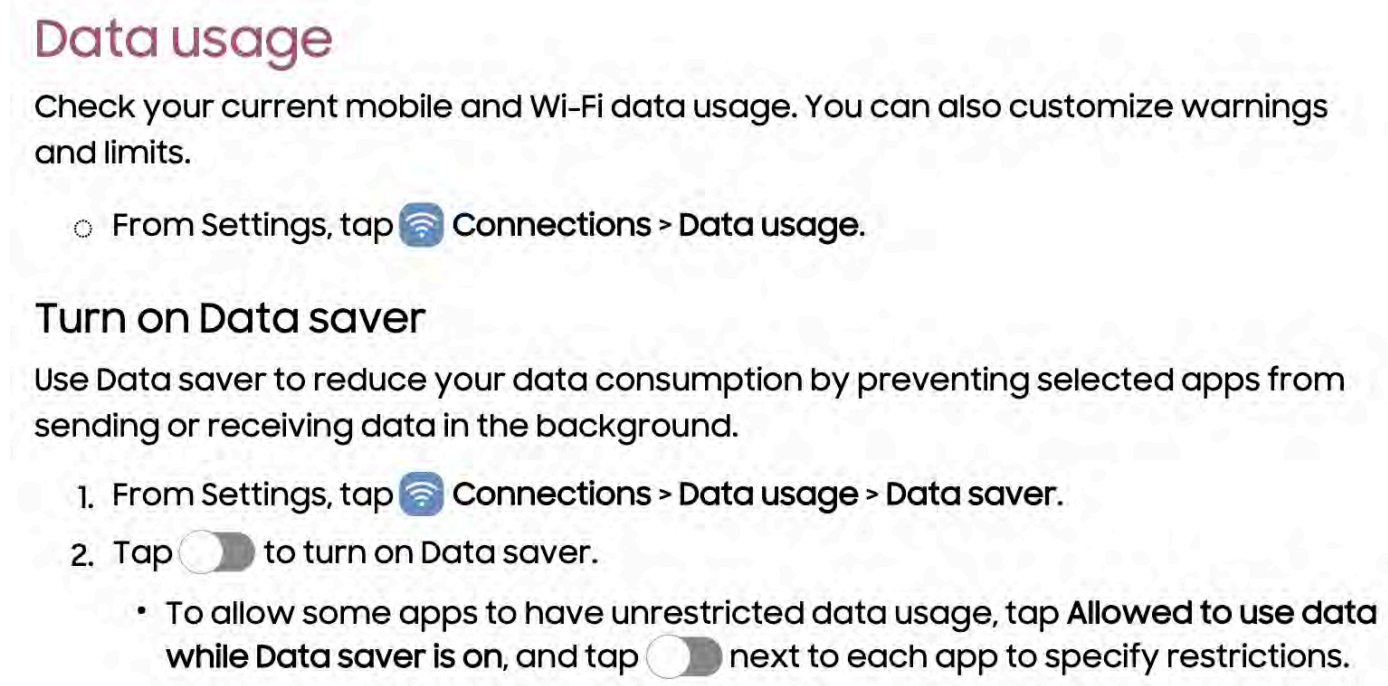
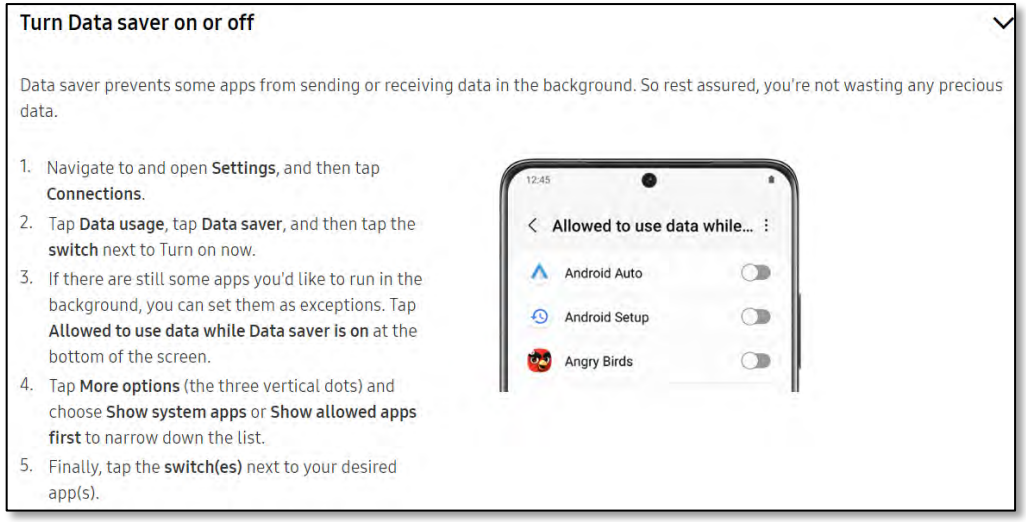
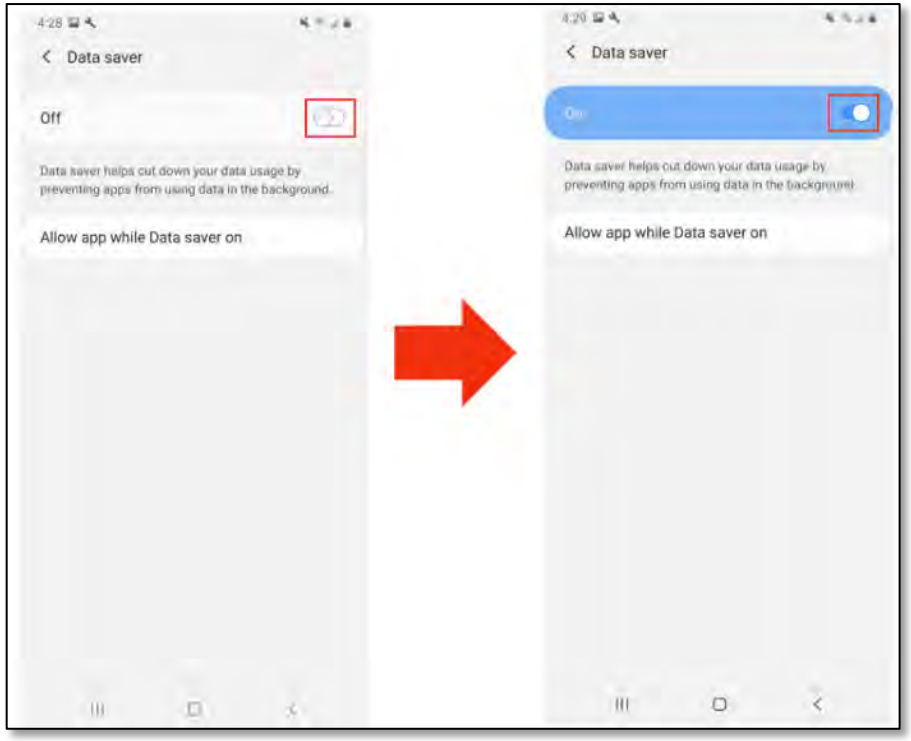
	

Claim	Public Documentation
	 As yet another example, the Accused Instrumentalities determine aspects of policies based on information from a network element. *See also, e.g.,* https://www.t-mobile.com/cell-phone-plans; https://www.t-mobile.com/cell-phone-plans/affordable-data-plans; https://www.t-mobile.com/business?INTNAV=tNav%3ABusiness; https://prepaid.t-mobile.com; https://www.t-mobile.com/cell-phone-plans/international-roaming-plans; https://www.t-mobile.com/support/coverage/domestic-roaming-data; https://www.t-mobile.com/customers/unlimited-roaming-sms-data; https://www.t-mobile.com/apps/t-mobile-app; https://www.t-mobile.com/apps/t-mobile-family-mode; https://www.t-mobile.com/support/devices/not-sold-by-t-mobile/byod-t-mobile-data-and-apn-settings; https://www.t-mobile.com/support/tutorials/device/apple/iphone-x/topic/connections-amp-network/apn-and-data-settings; https://developer.android.com/about/versions/pie/android-9.0:

Claim	Public Documentation
	Data cost sensitivity in JobScheduler Beginning in Android 9, `JobScheduler` can use network status signals provided by carriers to improve the handling of network-related jobs. Jobs can declare their estimated data size, signal prefetching, and specify detailed network requirements. `JobScheduler` then manages work according to the network status. For example, when the network signals that it is congested, `JobScheduler` might defer large network requests. When on an unmetered network, `JobScheduler` can run prefetch jobs to improve the user experience, such as by prefetching headlines. When adding jobs, make sure to use `setEstimatedNetworkBytes()`, `setPrefetch()`, and `setRequiredNetwork()` when appropriate to help `JobScheduler` handle the work properly. When your job executes, be sure to use the `Network` object returned by `JobParameters.getNetwork()`. Otherwise you'll implicitly use the device's default network which may not meet your requirements, causing unintended data usage. ; https://developer.android.com/training/basics/network-ops/reading-network-state; https://developer.android.com/training/connectivity/network-access-optimization; https://developer.android.com/reference/android/net/NetworkCapabilities.
[1e] and if it is determined that the service usage activity is the background activity, apply the policy.	The Accused Instrumentalities comprise "and if it is determined that the service usage activity is the background activity, apply the policy." For example, Samsung Galaxy phones and tablets utilize Data Saver which applies the policy to background service usage activity. *See, e.g.*, https://www.t-mobile.com/support/public-files/attachments/samsung/samsung-galaxy-s21-fe-5g/Samsung%20Galaxy%20S21%20FE%205G_English%20User%20Guide_FINAL2.pdf:

Claim	Public Documentation
	 ; https://www.samsung.com/us/support/answer/ANS00079018/:

Claim	Public Documentation
	 ; https://www.samsung.com/ae/support/mobile-devices/android-pie-what-is-the-data-saver-feature/:

Claim	Public Documentation
	

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	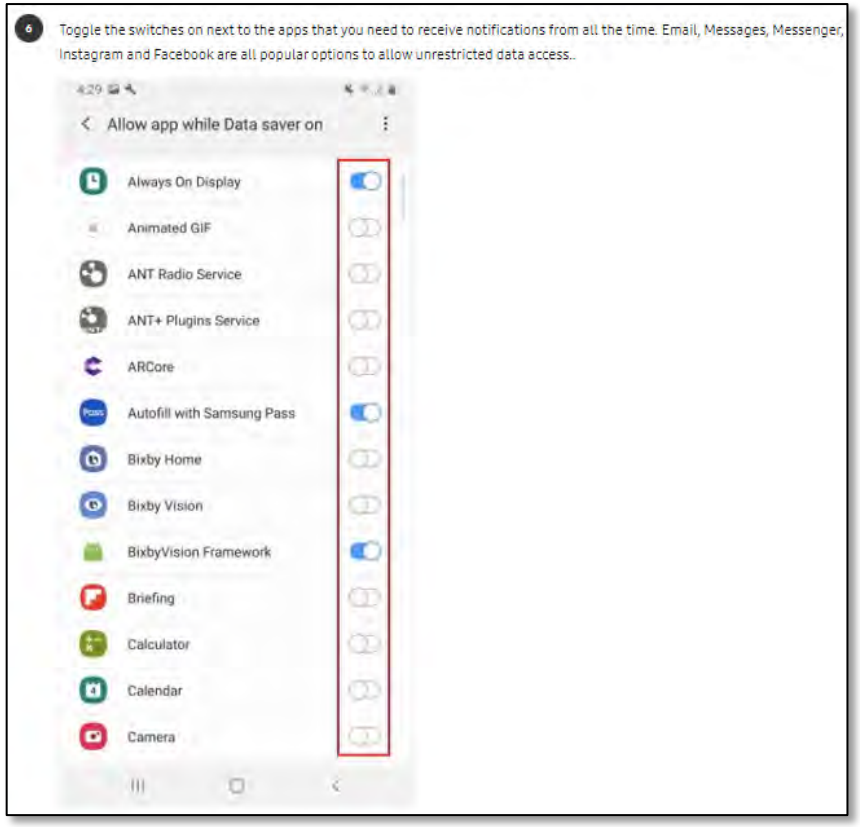 ; https://www.samsung.com/us/support/answer/ANS00078987/:

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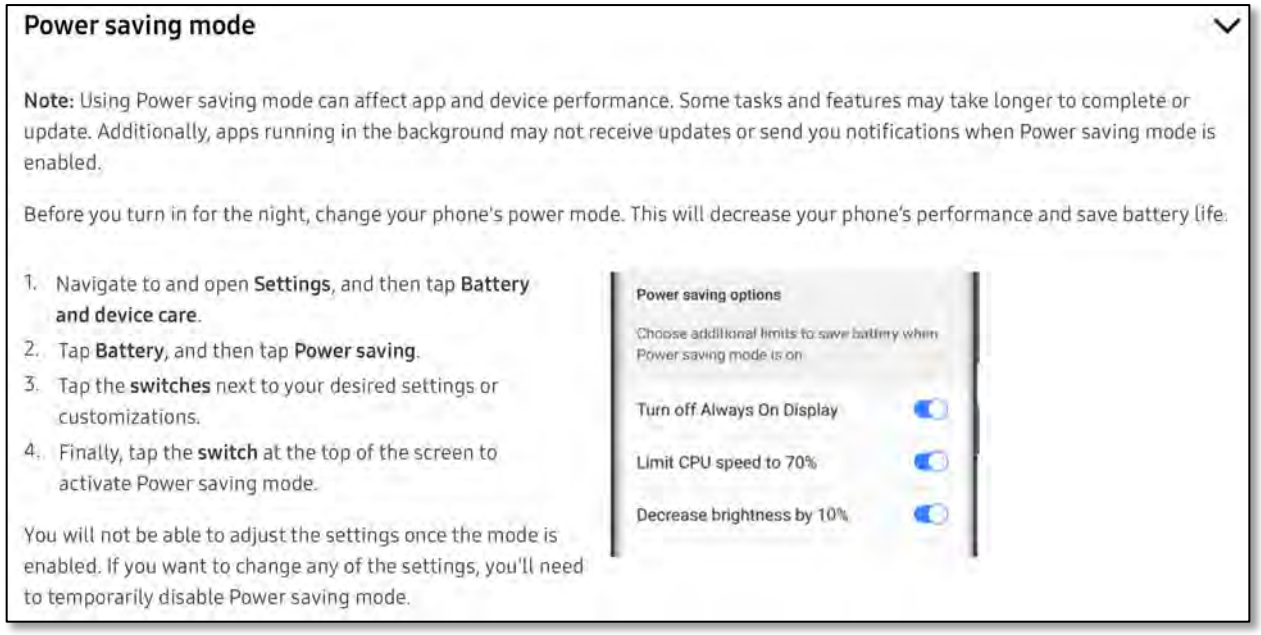
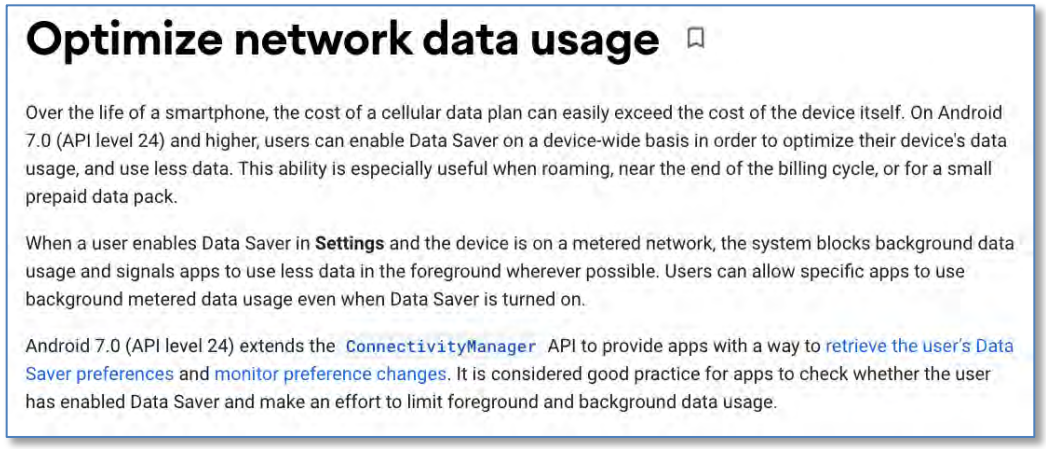
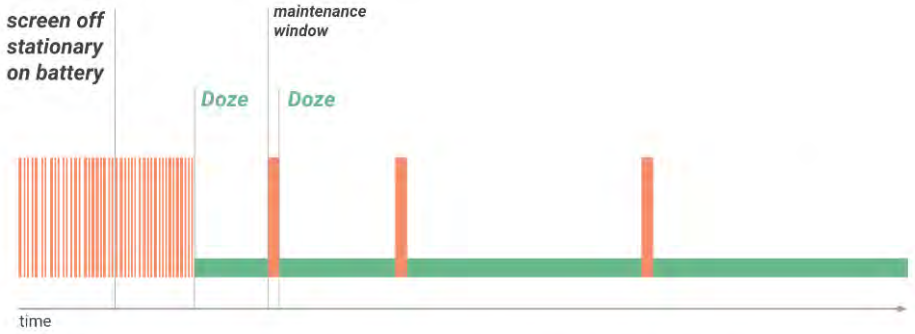
	 ; https://developer.android.com/training/basics/network-ops/data-saver: 

Claim	Public Documentation

	Check data saver preferences
	On Android 7.0 (API level 24) and higher, apps can use the `ConnectivityManager` API to determine what data usage restrictions are being applied. The `getRestrictBackgroundStatus()` method returns one of the following values:
	`RESTRICT_BACKGROUND_STATUS_DISABLED`
	Data Saver is disabled.
	`RESTRICT_BACKGROUND_STATUS_ENABLED`
	The user has enabled Data Saver for this app. Apps should make an effort to limit data usage in the foreground and gracefully handle restrictions to background data usage.
	`RESTRICT_BACKGROUND_STATUS_WHITELISTED`
	The user has enabled Data Saver but the app is allowed to bypass it. Apps should still make an effort to limit foreground and background data usage.
	Limit data usage whenever the device is connected to a metered network, even if Data Saver is disabled or the app is allowed to bypass it. The following sample code uses `ConnectivityManager.isActiveNetworkMetered()` and `ConnectivityManager.getRestrictBackgroundStatus()` to determine how much data the app should use:
	; https://developer.android.com/training/monitoring-device-state/doze-standby:
	Optimize for Doze and App Standby
	Starting from Android 6.0 (API level 23), Android introduces two power-saving features that extend battery life for users by managing how apps behave when a device is not connected to a power source. *Doze* reduces battery consumption by deferring background CPU and network activity for apps when the device is unused for long periods of time. *App Standby* defers background network activity for apps with which the user has not recently interacted.
	While the device is in Doze, apps' access to certain battery-intensive resources is deferred until maintenance windows. The specific restrictions are listed in Power Management Restrictions.
	Doze and App Standby manage the behavior of all apps running on Android 6.0 or higher, regardless whether they are specifically targeting API level 23. To ensure the best experience for users, test your app in Doze and App Standby modes and make any necessary adjustments to your code. The sections below provide details.

Claim	Public Documentation
	Understanding Doze If a user leaves a device unplugged and stationary for a period of time, with the screen off, the device enters Doze mode. In Doze mode, the system attempts to conserve battery by restricting apps' access to network and CPU-intensive services. It also prevents apps from accessing the network and defers their jobs, syncs, and standard alarms. Periodically, the system exits Doze for a brief time to let apps complete their deferred activities. During this *maintenance window*, the system runs all pending syncs, jobs, and alarms, and lets apps access the network.  **Figure 1.** Doze provides a recurring maintenance window for apps to use the network and handle pending activities. At the conclusion of each maintenance window, the system again enters Doze, suspending network access and deferring jobs, syncs, and alarms. Over time, the system schedules maintenance windows less and less frequently, helping to reduce battery consumption in cases of longer-term inactivity when the device is not connected to a charger. As soon as the user wakes the device by moving it, turning on the screen, or connecting a charger, the system exits Doze and all apps return to normal activity. The Doze restriction on network access is also likely to affect your app, especially if the app relies on real-time messages such as tickles or notifications. If your app requires a persistent connection to the network to receive messages, you should use Firebase Cloud Messaging (FCM) if possible. ; https://developer.android.com/topic/performance/appstandby:

App Standby Buckets

Android 9 (API level 28) and higher support **App Standby Buckets**. App Standby Buckets help the system prioritize apps' requests for resources based on how recently and how frequently the apps are used. Based on app usage patterns, each app is placed in one of five priority **buckets**. The system limits the device resources available to each app based on which bucket the app is in.

Priority buckets

The system dynamically assigns each app to a priority bucket, reassigning the apps as needed. The system may rely on a preloaded app that uses machine learning to determine how likely each app is to be used, and assigns apps to the appropriate buckets. If the system app is not present on a device, the system defaults to sorting apps based on how recently they were used. More active apps are assigned to buckets that give the apps higher priority, making more system resources available to the app. In particular, the bucket determines how frequently the app's jobs run, and how often the app can trigger alarms. These restrictions apply only while the device is on battery power; the system does not impose these restrictions on apps while the device is charging.

Note: Every manufacturer can set their own criteria for how non-active apps are assigned to buckets. You should not try to influence which bucket your app is assigned to. Instead, focus on making sure your app behaves well in whatever bucket it might be in. Your app can find out what bucket it's currently in by calling `UsageStatsManager.getAppStandbyBucket()`.

The buckets are:

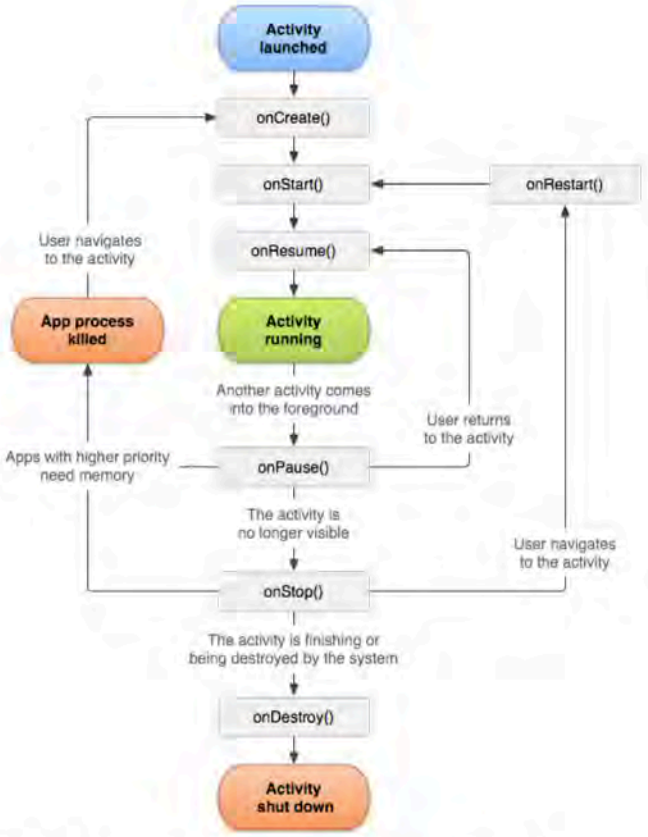
1. Active: App is currently being used or was very recently used.
2. Working set: App is in regular use.
3. Frequent: App is often used, but not every day.
4. Rare: App is not frequently used.
5. Restricted: App consumes a great deal of system resources, or may exhibit undesirable behavior.

In addition, there's a special **never** bucket for apps that have been installed but have never been run. The system imposes severe restrictions on these apps.

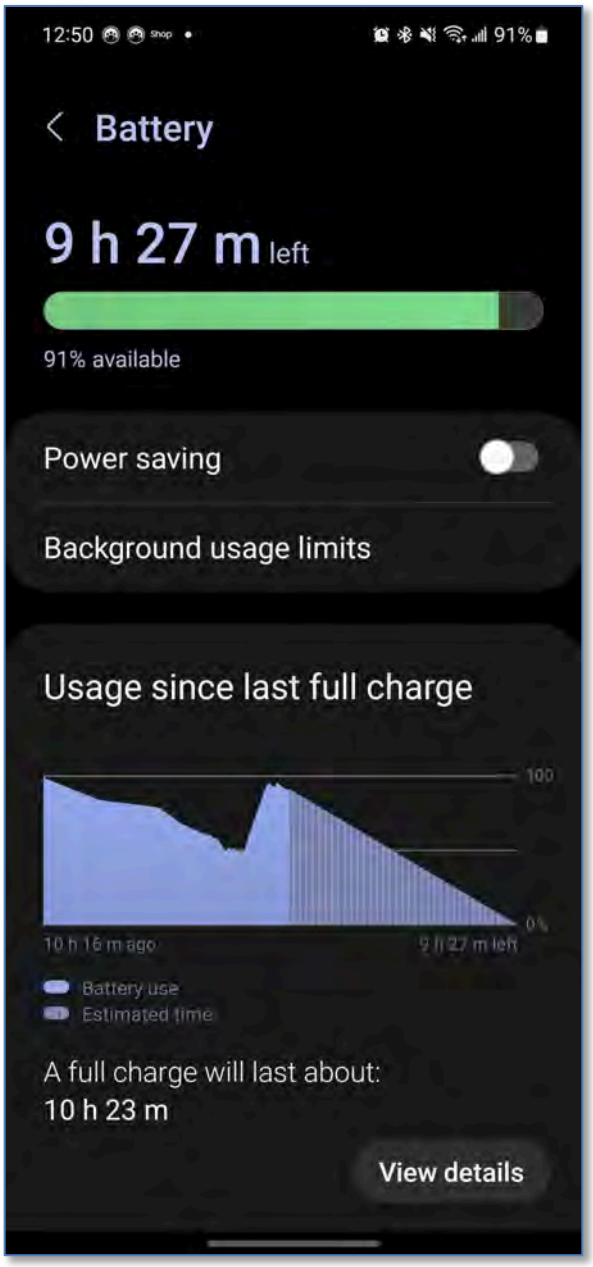
Claim	Public Documentation
	; https://developer.android.com/topic/performance/power/power-details: **Power management restrictions** As described in Power management, the system can impose power restrictions on apps for a number of reasons. The following table outlines the current restrictions. These restrictions do not apply while the device is charging. In each case, the most restrictive applicable setting is the one that takes effect. For example, if Battery Saver is active and an app is in the Rare bucket, the more stringent App Standby Buckets restrictions on Firebase Cloud Messaging (FCM) are applied.

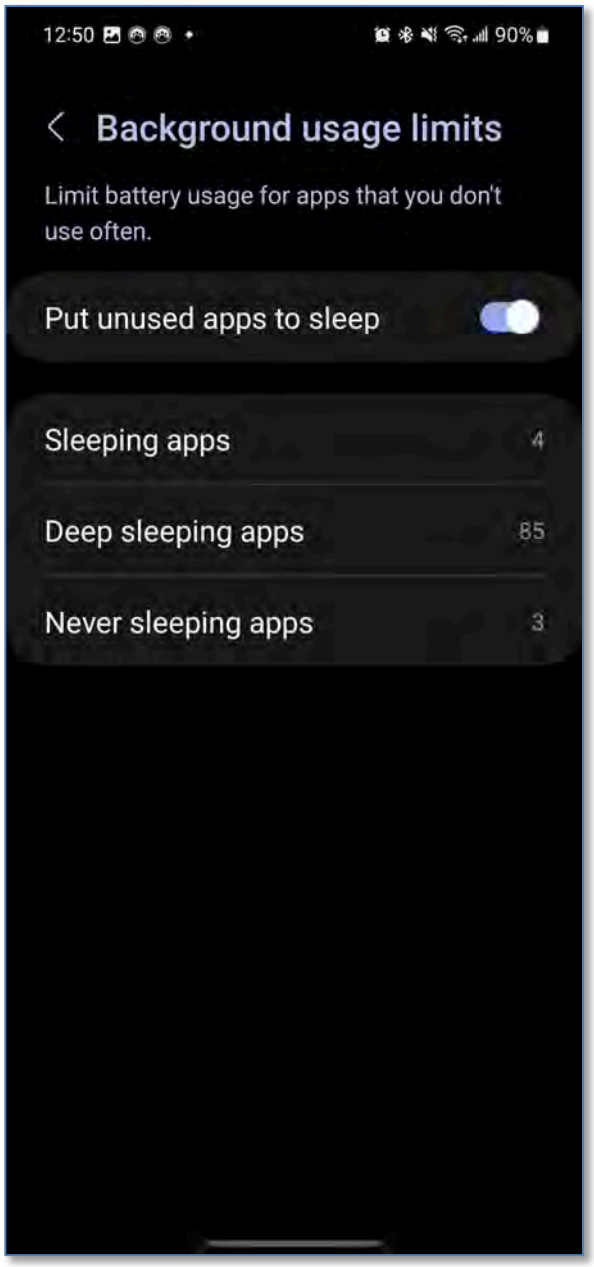
Setting	Jobs *	Alarms	Network †	Firebase Cloud Messaging §
User Restricts Background Activity				
Restrictions enabled:	Never	Never	No restriction	No restriction
Doze				
Doze active:	Deferred to window	Regular alarms: Deferred to window Inexact while-idle alarms: Limited to 1 per 9 minutes Exact while-idle alarms: Limited to 72 per hour	Deferred to window	High priority: No restriction Normal priority: Deferred to window
App Standby Buckets (by bucket)				Prior to Android 13 (API Level 33)
Active:	No restriction	No restriction	No restriction	No restriction
Working set:	Limited to 10 minutes every 2 hours	Limited to 10 per hour	No restriction	No restriction
Frequent:	Limited to 10 minutes every 8 hours	Limited to 2 per hour	No restriction	High priority: 10/day
Rare:	Limited to 10 minutes every 24 hours	Limited to 1 per hour	Disabled	High priority: 5/day
Restricted:	Once per day	One alarm per day, either an exact alarm or an inexact alarm	Disabled	High priority: 5/day

Claim	Public Documentation
	; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler; https://developer.android.com/guide/background/persistent; https://developer.android.com/guide/components/activities/activity-lifecycle:

Claim	Public Documentation
	Activity-lifecycle concepts To navigate transitions between stages of the activity lifecycle, the `Activity` class provides a core set of six callbacks: `onCreate()`, `onStart()`, `onResume()`, `onPause()`, `onStop()`, and `onDestroy()`. The system invokes each of these callbacks as the activity enters a new state. Figure 1 presents a visual representation of this paradigm. As the user begins to leave the activity, the system calls methods to dismantle the activity. In some cases, the activity is only partially dismantled and still resides in memory, such as when the user switches to another app. In these cases, the activity can still come back to the foreground. If the user returns to the activity, it resumes from where the user left off. With a few exceptions, apps are restricted from starting activities when running in the background. The system's likelihood of killing a given process, along with the activities in it, depends on the state of the activity at the time. For more information on the relationship between state and vulnerability to ejection, see the section about activity state and ejection from memory. Depending on the complexity of your activity, you probably don't need to implement all the lifecycle methods. However, it's important that you understand each one and implement those that make your app behave the way users expect.  **Figure 1.** A simplified illustration of the activity lifecycle.

Claim	Public Documentation
	; https://developer.android.com/guide/components/activities/process-lifecycle; https://developer.android.com/guide/background; https://developer.android.com/about/versions/pie/android-9.0; https://developer.android.com/training/basics/network-ops/reading-network-state; https://developer.android.com/training/connectivity/network-access-optimization; https://developer.android.com/reference/android/net/NetworkCapabilities. *see also* the exemplary screenshots below:


12:50
91%
Battery
9 h 27 m left
91% available
Power saving
Background usage limits
Usage since last full charge
100
0%
10 h 16 m ago
9 h 27 m left
Battery use
Estimated time
A full charge will last about:
10 h 23 m
View details


12:50
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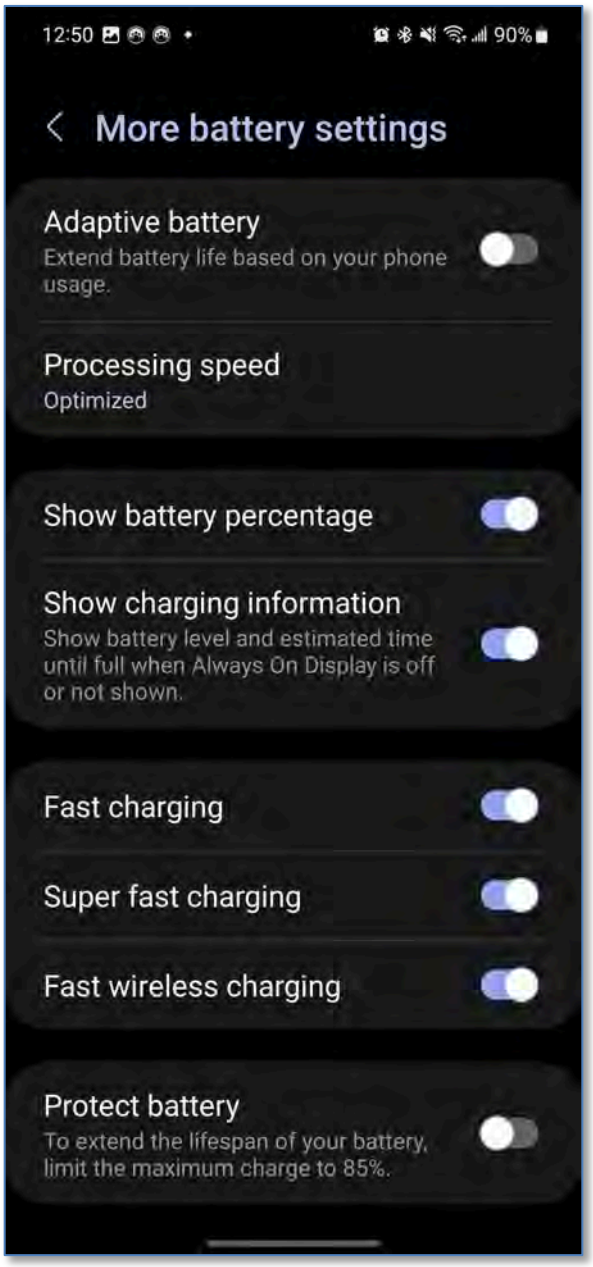
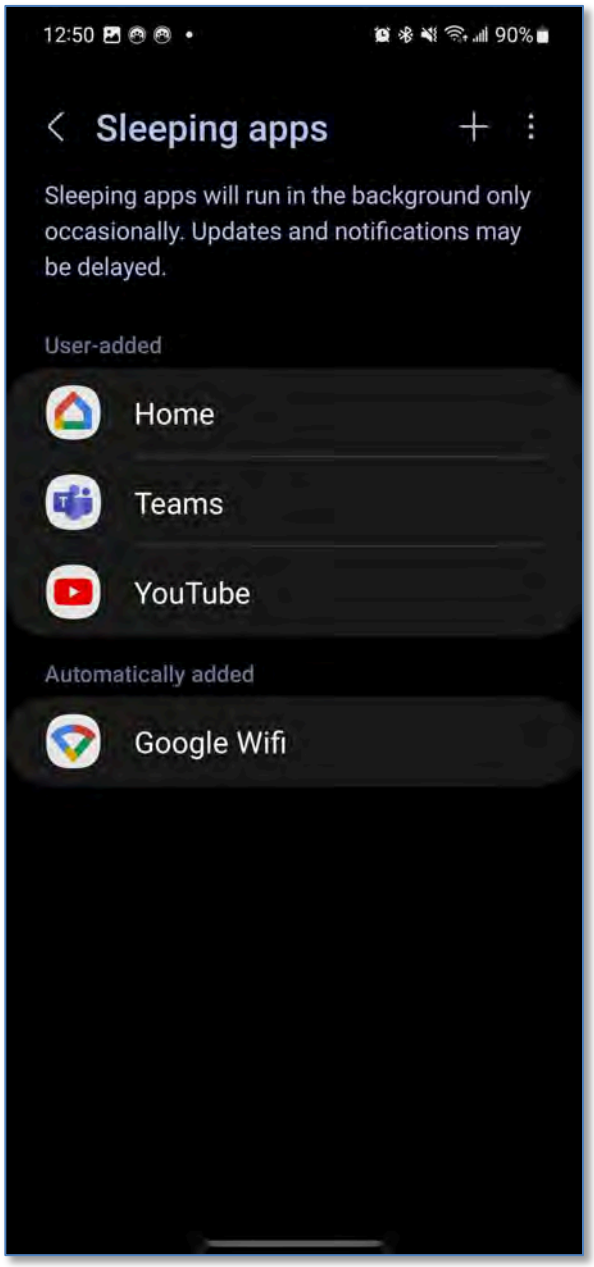
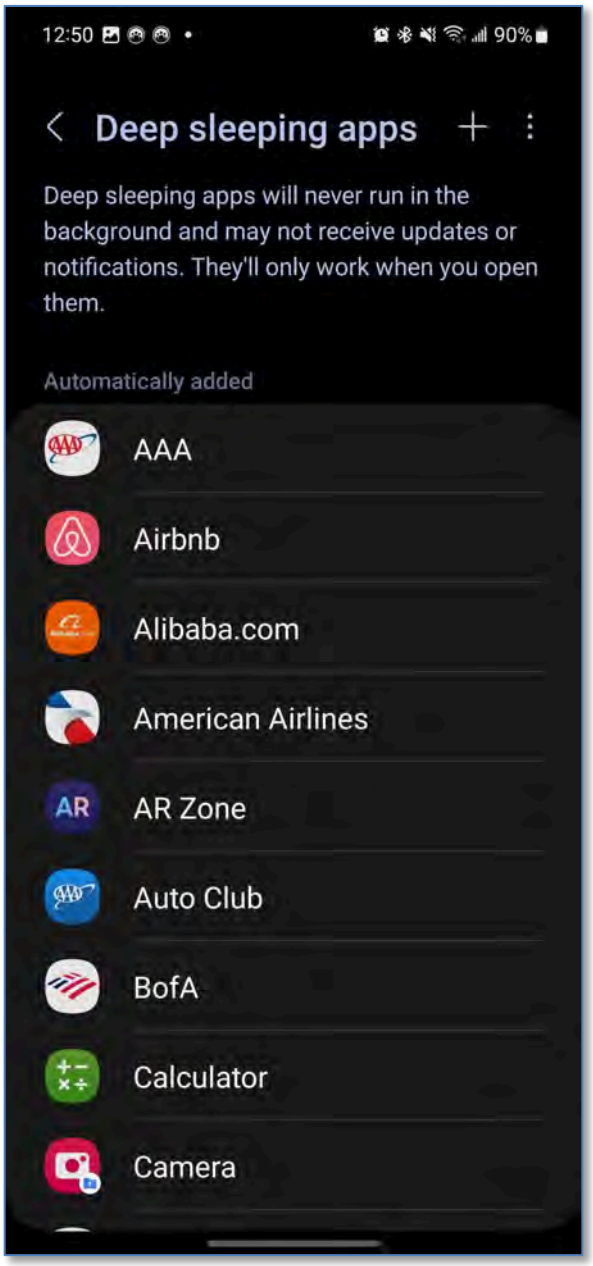
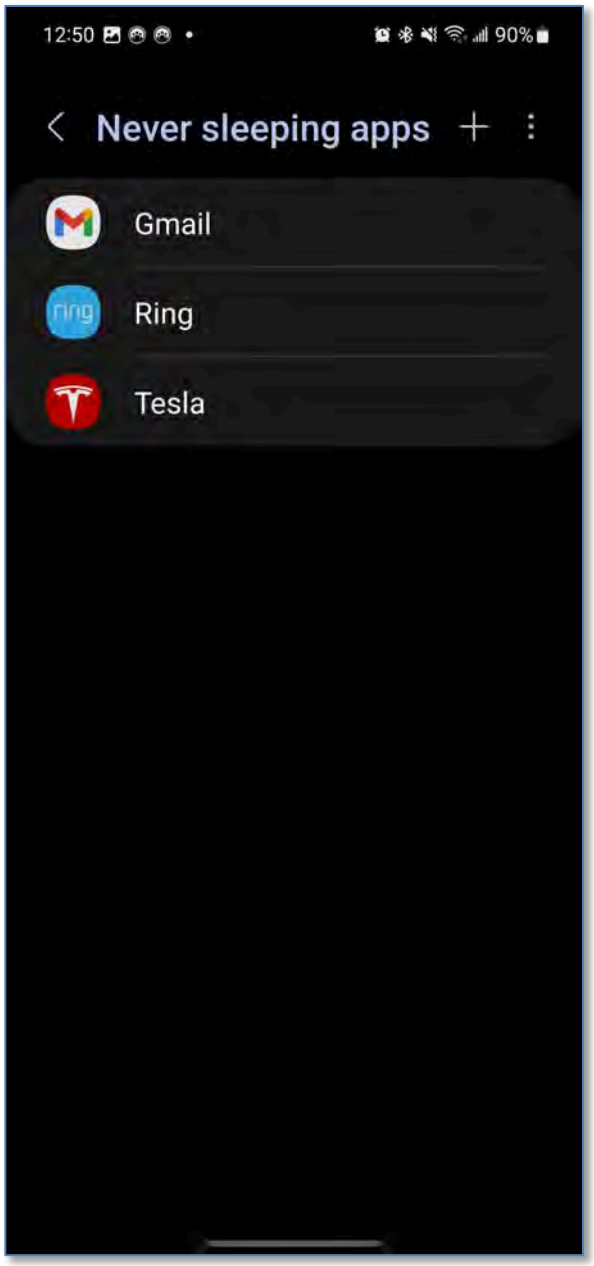
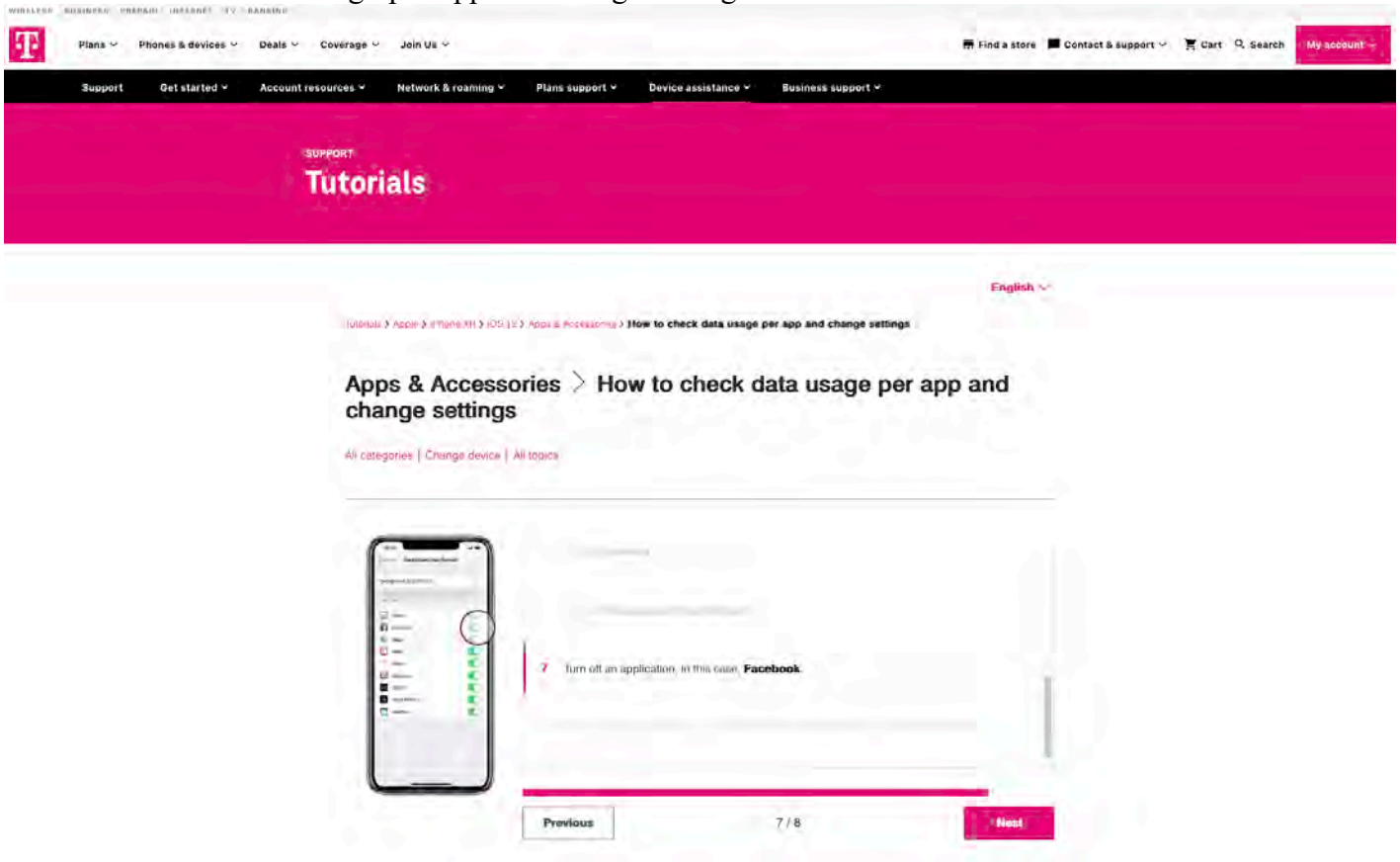
Never sleeping apps 3


12:50
90%
More battery settings
Adaptive battery
Extend battery life based on your phone usage.
Processing speed
Optimized
Show battery percentage
Show charging information
Show battery level and estimated time until full when Always On Display is off or not shown.
Fast charging
Super fast charging
Fast wireless charging
Protect battery
To extend the lifespan of your battery, limit the maximum charge to 85%.


12:50
90%
Sleeping apps
Sleeping apps will run in the background only occasionally. Updates and notifications may be delayed.
User-added
Home
Teams
YouTube
Automatically added
Google Wifi


12:50
90%
Deep sleeping apps
Deep sleeping apps will never run in the background and may not receive updates or notifications. They'll only work when you open them.
Automatically added
AAA
Airbnb
Alibaba.com
American Airlines
AR Zone
Auto Club
BofA
Calculator
Camera


12:50
90%
Never sleeping apps
Gmail
Ring
Tesla

Claim	Public Documentation
	See also, e.g., https://www.t-mobile.com/support/tutorials/device/apple/iphone-xr/topic/apps-amp-accessories/how-to-check-data-usage-per-app-and-change-settings/7  ; https://support.apple.com/en-us/HT202070:

Claim	Public Documentation
	 https://support.apple.com/en-us/HT205234:

Use Low Power Mode to save battery life on your iPhone or iPad

Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

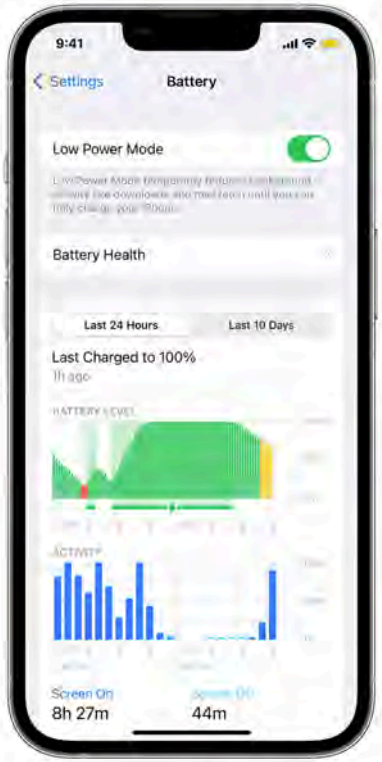
To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.

Low Power Mode reduces or affects these features:

- 5G (except for video streaming) on iPhone 12 and iPhone 13 models[1]
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display[2]
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

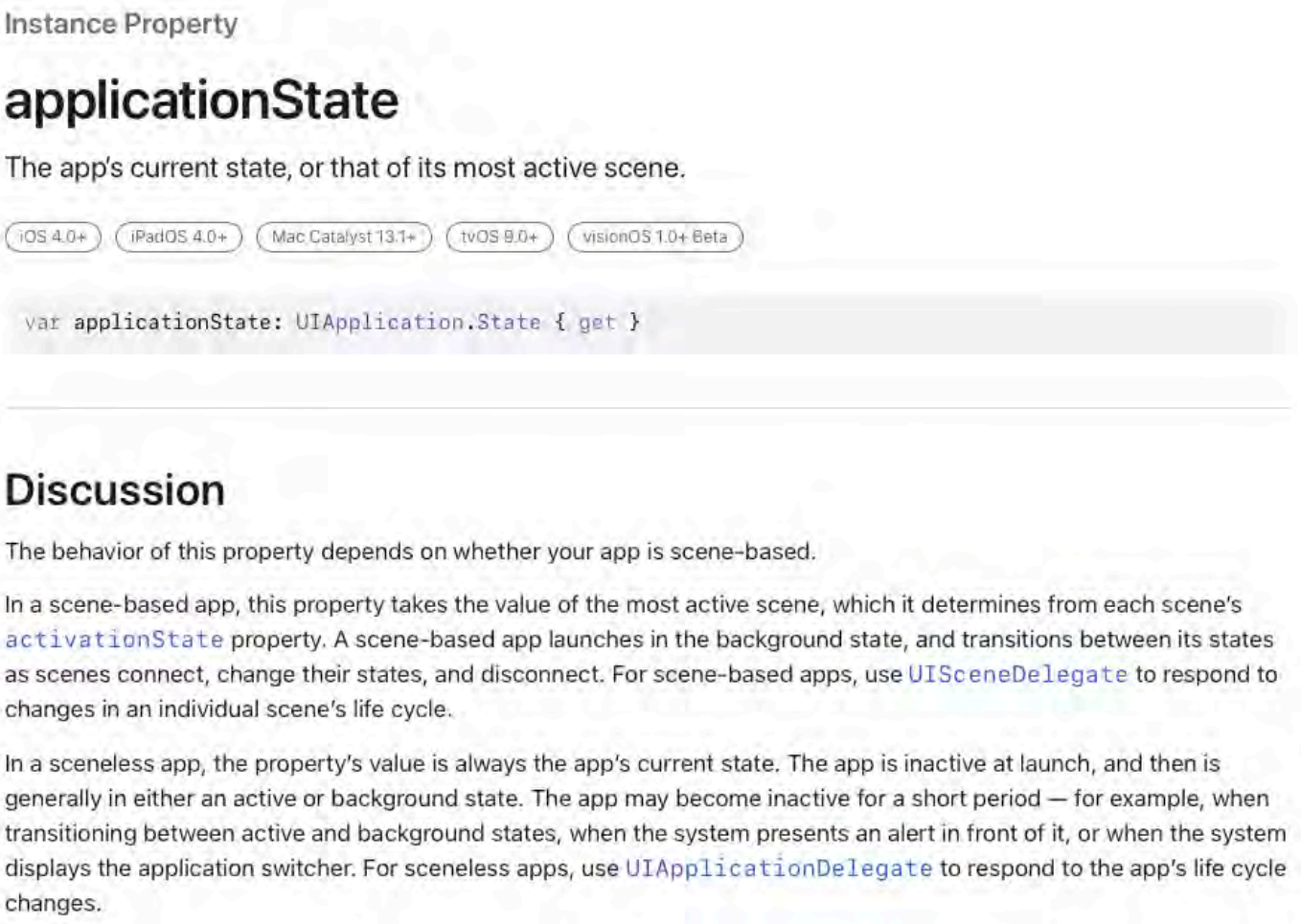
When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.



1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

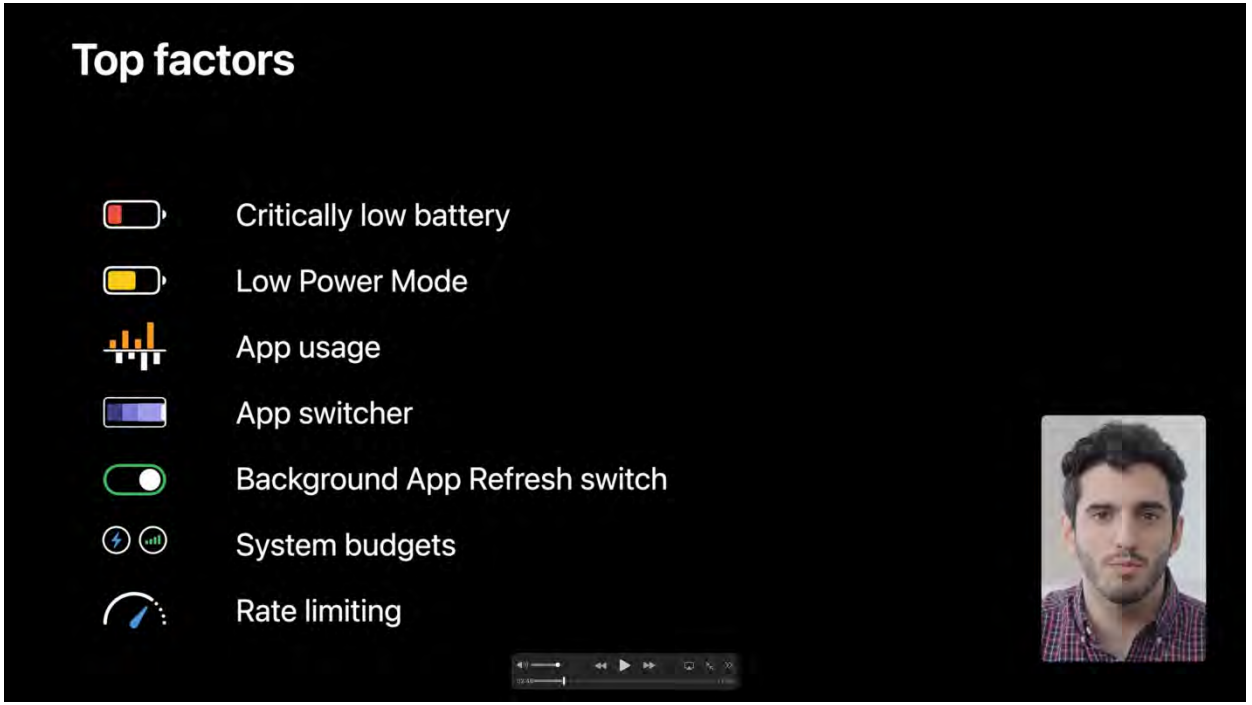
2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

Claim	Public Documentation
	https://www.apple.com/batteries/maximizing-performance/: **View Battery Usage information** With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery. Here are the messages you may see listed below the apps you've been using: **Background Activity.** This indicates that the battery was used by the app while it was in the background — that is, while you were using another app. • To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely. • If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data. ; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate:

Claim	Public Documentation
	 ; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/;

Claim	Public Documentation
	https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks https://developer.apple.com/documentation/backgroundtasks/bgapprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocessingtask; https://developer.apple.com/documentation/backgroundtasks/bgtask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate; https://developer.apple.com/documentation/uikit/uiapplication/state; https://developer.apple.com/documentation/foundation/url_loading_system; https://developer.apple.com/documentation/foundation/urlsession; https://developer.apple.com/documentation/avfoundation/avplayer; https://developer.apple.com/documentation/avfoundation/media_playback/configuring_your_app_for_media_playback; https://developer.apple.com/videos/play/wwdc2019/707/; https://developer.apple.com/videos/play/wwdc2020/10063:

Claim	Public Documentation

Claim	Public Documentation
	

Claim	Public Documentation
	 See also, e.g., https://www.t-mobile.com/cell-phone-plans; https://www.t-mobile.com/cell-phone-plans/affordable-data-plans; https://www.t-mobile.com/business?INTNAV=tNav%3ABusiness; https://prepaid.t-mobile.com; https://www.t-mobile.com/cell-phone-plans/international-roaming-plans; https://www.t-mobile.com/support/coverage/domestic-roaming-data; https://www.t-mobile.com/customers/unlimited-roaming-sms-data.
2. The non-transitory computer-readable storage medium recited in claim 1, wherein the first software component comprises at least a portion of an application component or at least a portion of an operating system component, and	The Accused Instrumentalities comprise the "non-transitory computer-readable storage medium recited in claim 1, wherein the first software component comprises at least a portion of an application component or at least a portion of an operating system component, and wherein the one or more prospective or successful communications over the wireless network comprise an update to the first software component." *See*, for example, the disclosures identified for claim 1.

Claim	Public Documentation
wherein the one or more prospective or successful communications over the wireless network comprise an update to the first software component.	As a further example, the Accused Instrumentalities comprise prospective or successful communications by applications or portions of applications (e.g., by "checking for updates and new content") over wireless networks to "refresh in the background," perform "Automatic downloads," "prevent[] some apps from sending or receiving data in the background," "apps running in the background may not receive updates," etc. *See, e.g.,* https://support.apple.com/en-us/HT202070:

Claim	Public Documentation
	 https://support.apple.com/en-us/HT205234:

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When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.

Low Power Mode reduces or affects these features:

- 5G (except for video streaming) on iPhone 12 and iPhone 13 models[1]
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display[2]
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

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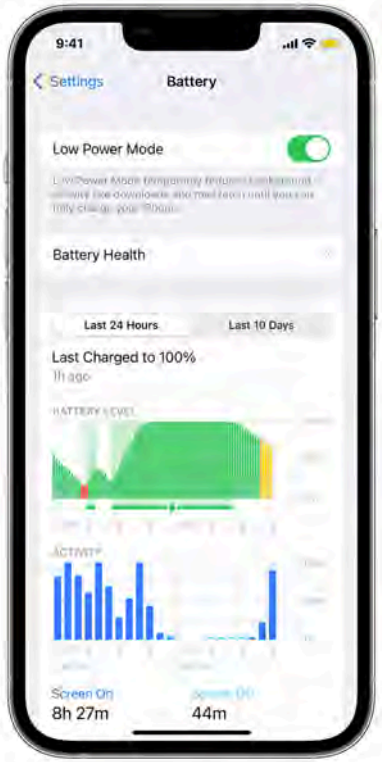
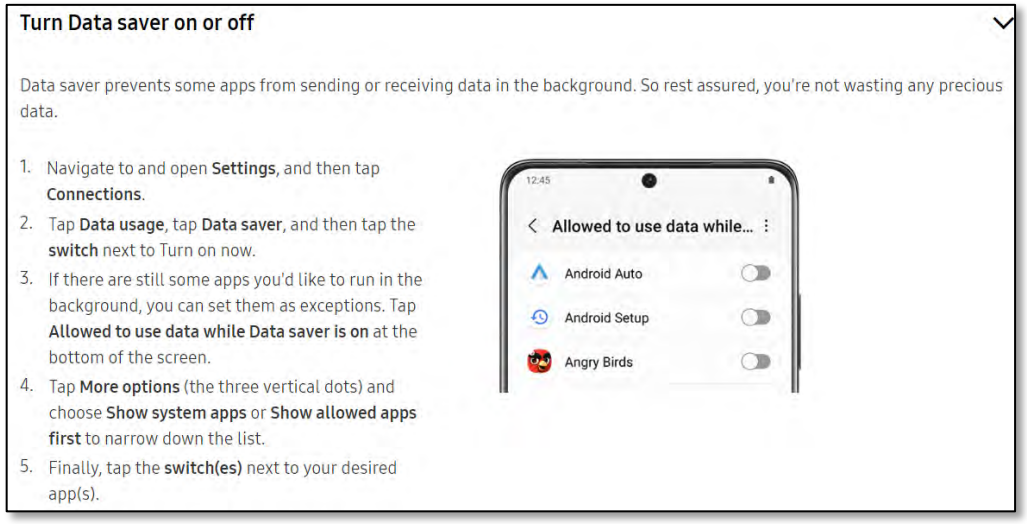
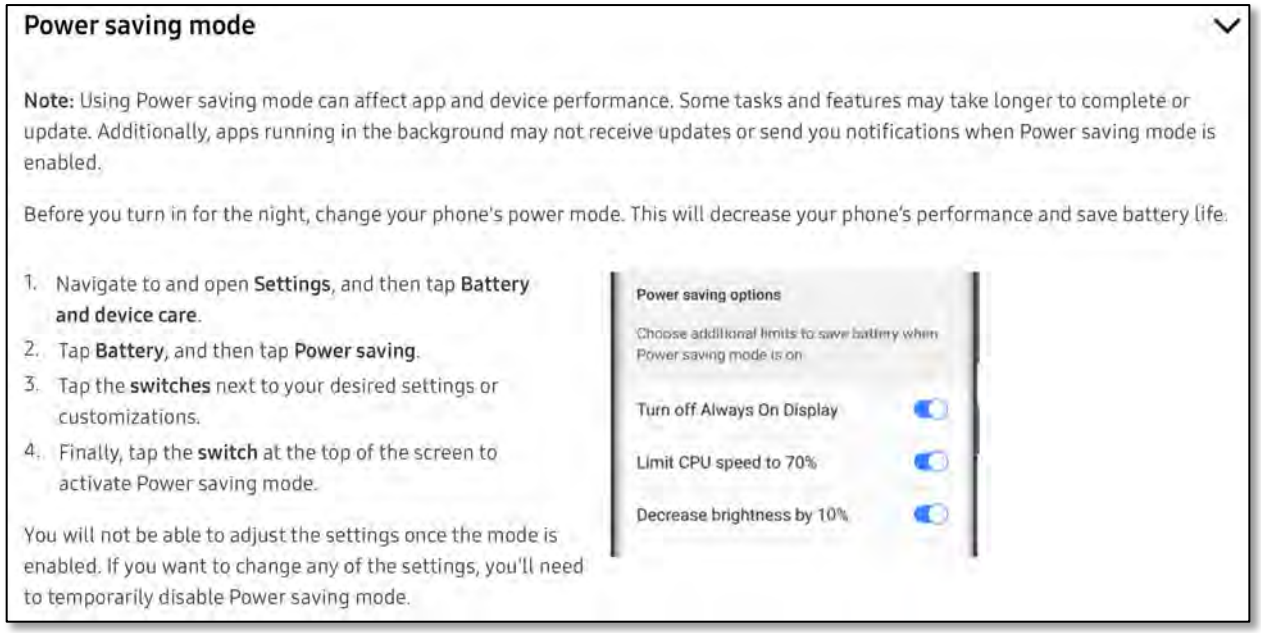


1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

Claim	Public Documentation
	https://www.apple.com/batteries/maximizing-performance/: **View Battery Usage information** With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery. Here are the messages you may see listed below the apps you've been using: **Background Activity.** This indicates that the battery was used by the app while it was in the background — that is, while you were using another app. • To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely. • If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data. ; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/; https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks

Claim	Public Documentation
	https://developer.apple.com/documentation/backgroundtasks/bgapprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocessingtask; https://developer.apple.com/documentation/backgroundtasks/bgtask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://www.samsung.com/us/support/answer/ANS00079018/:  ; https://www.samsung.com/us/support/answer/ANS00078987/:

Claim	Public Documentation
	 ; https://developer.android.com/training/monitoring-device-state/doze-standby; https://developer.android.com/topic/performance/appstandby; https://developer.android.com/topic/performance/power/power-details; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler.
3. The non-transitory computer-readable storage medium recited in claim 1, wherein the one or more prospective or successful communications over the wireless network comprise a communication associated with a network access, background signaling, a cloud synchronization service, an information feed, a download, an	The Accused Instrumentalities comprise the "the one or more prospective or successful communications over the wireless network comprise a communication associated with a network access, background signaling, a cloud synchronization service, an information feed, a download, an e-mail, a chat client, a security update, a peer-to-peer networking application update, a report of a behavior associated with the wireless end-user device, or a combination of these." *See*, for example, the disclosures identified for claim 1.

Claim	Public Documentation
e-mail, a chat client, a security update, a peer-to-peer networking application update, a report of a behavior associated with the wireless end-user device, or a combination of these.	As a further example, the Accused Instrumentalities comprise prospective or successful communications by applications or portions of applications (e.g., by "checking for updates and new content") over wireless networks to "refresh in the background," perform "Automatic downloads," "Email fetch," "temporarily pause" iCloud photos, "prevent[] some apps from sending or receiving data in the background," "apps running in the background may not receive updates," etc. *See, e.g.,* https://support.apple.com/en-us/HT202070:

Claim	Public Documentation
	 https://support.apple.com/en-us/HT205234:

Use Low Power Mode to save battery life on your iPhone or iPad

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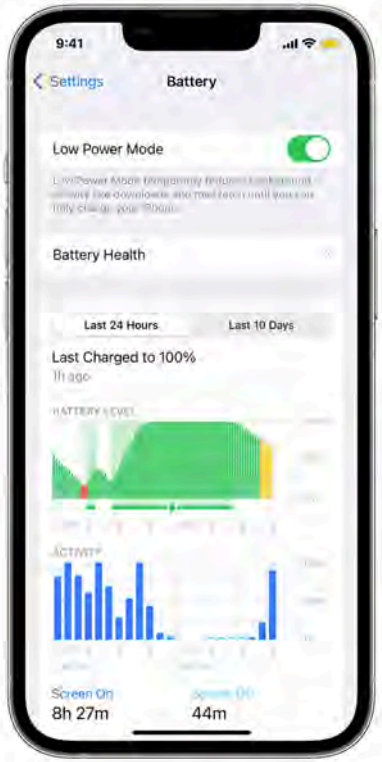
When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.

Low Power Mode reduces or affects these features:

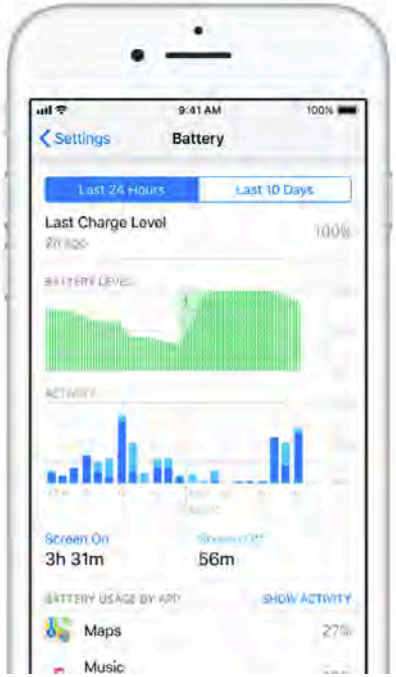
- 5G (except for video streaming) on iPhone 12 and iPhone 13 models[1]
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display[2]
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

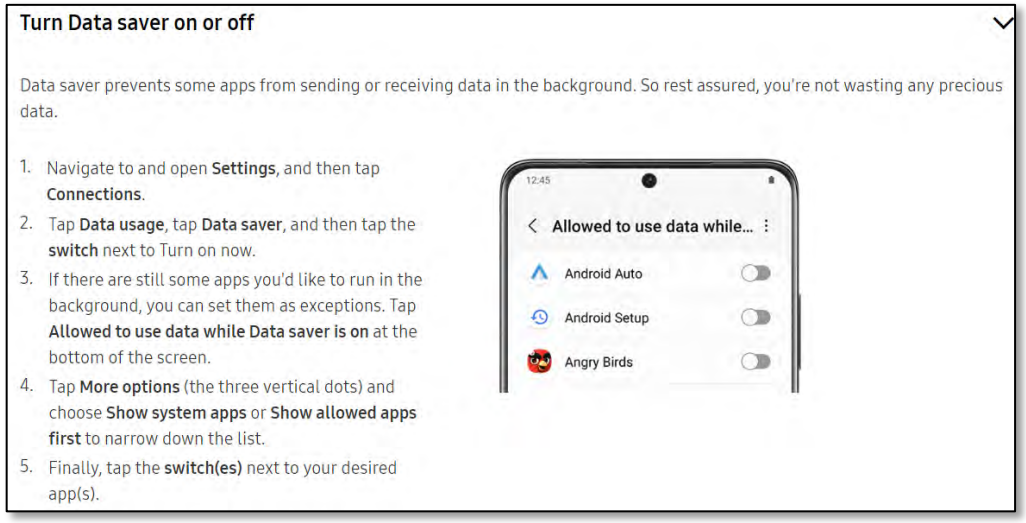
When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.

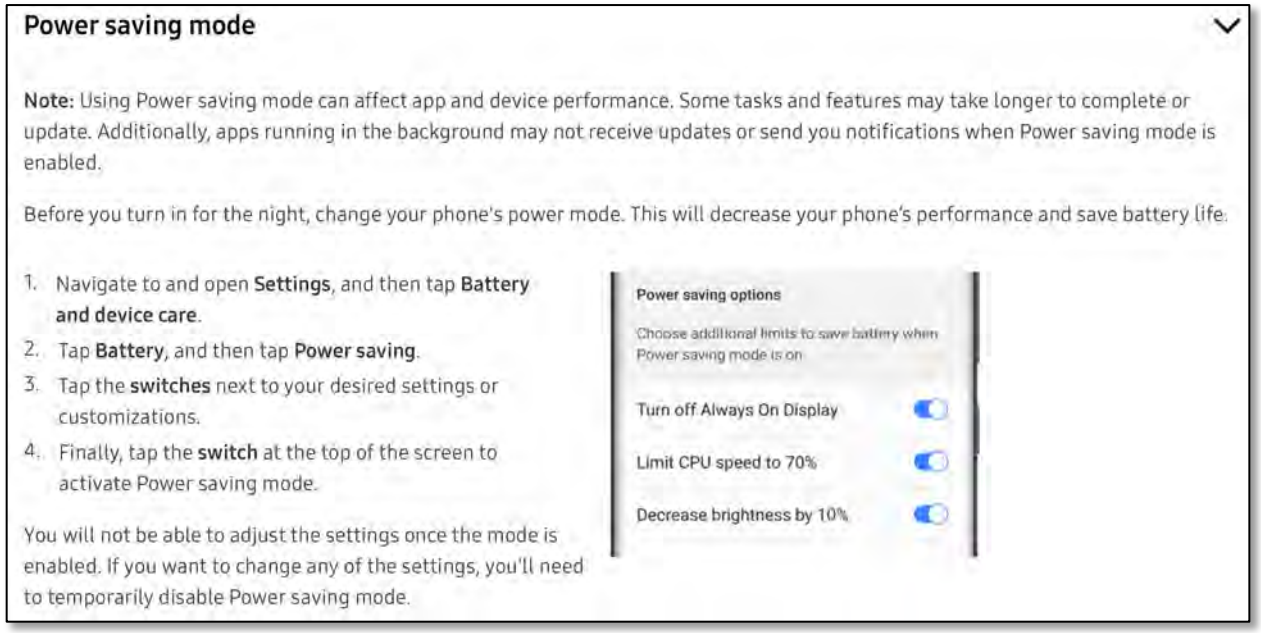


1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

Claim	Public Documentation
	https://www.apple.com/batteries/maximizing-performance/: **View Battery Usage information** With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery. Here are the messages you may see listed below the apps you've been using: **Background Activity.** This indicates that the battery was used by the app while it was in the background — that is, while you were using another app. • To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely. • If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data.  ; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/; https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks

Claim	Public Documentation
	https://developer.apple.com/documentation/backgroundtasks/bgapprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocessingtask; https://developer.apple.com/documentation/backgroundtasks/bgtask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://www.samsung.com/us/support/answer/ANS00079018/:  ; https://www.samsung.com/us/support/answer/ANS00078987/:

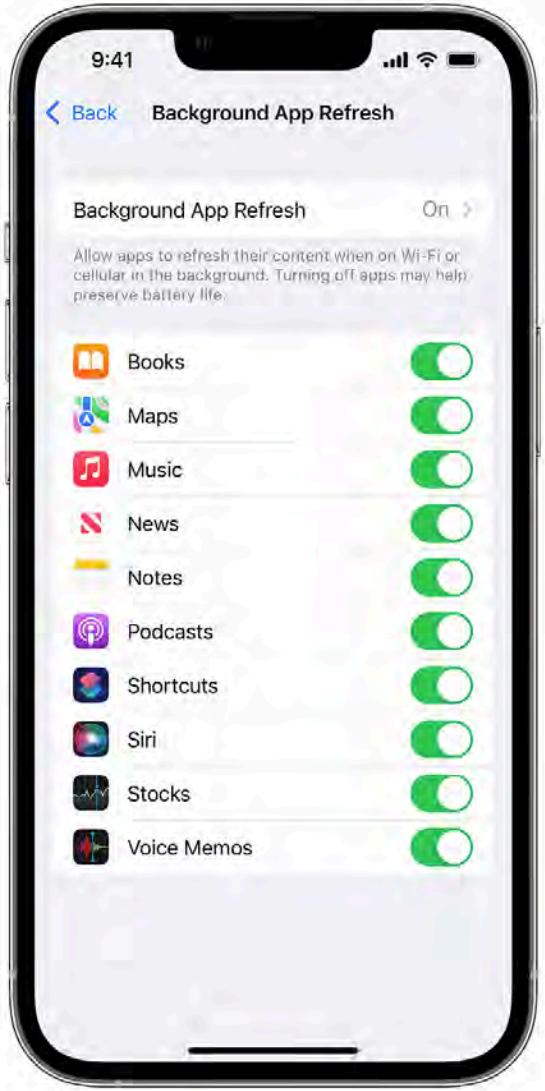
Claim	Public Documentation
	 ; https://developer.android.com/training/monitoring-device-state/doze-standby; https://developer.android.com/topic/performance/appstandby; https://developer.android.com/topic/performance/power/power-details; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler.
4. The non-transitory computer-readable storage medium recited in claim 1, wherein the one or more prospective or successful communications over the wireless network comprise a communication associated with a content update or a content download.	The Accused Instrumentalities comprise the "non-transitory computer-readable storage medium recited in claim 1, wherein the one or more prospective or successful communications over the wireless network comprise a communication associated with a content update or a content download." *See*, for example, the disclosures identified for claim 1. As a further example, the Accused Instrumentalities comprise prospective or successful communications by applications or portions of applications (e.g., by "checking for updates and new content") over wireless networks to "refresh in the background," perform "Automatic downloads," "Email fetch," "temporarily pause"

Claim	Public Documentation
	iCloud photos, "prevent[] some apps from sending or receiving data in the background," "apps running in the background may not receive updates," etc. *See, e.g.,* https://support.apple.com/en-us/HT202070:

Use Background App Refresh

After you switch to a different app, some apps run for a short period of time before they're set to a suspended state. Apps that are in a suspended state aren't actively in use, open, or taking up system resources. With Background App Refresh, suspended apps can check for updates and new content.

If you want suspended apps to check for new content, go to Settings > General > Background App Refresh and turn on Background App Refresh. If you quit an app from the app switcher, it might not be able to run or check for new content before you open it again.



Claim	Public Documentation
	https://support.apple.com/en-us/HT205234:

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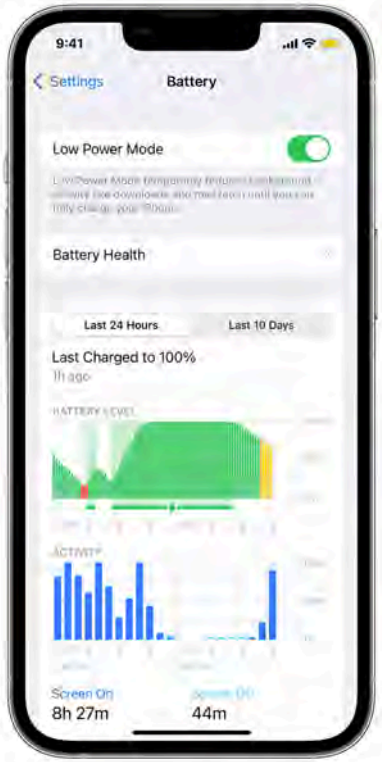

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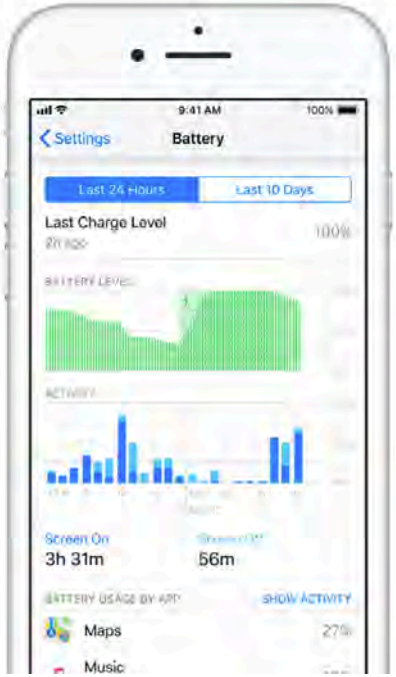
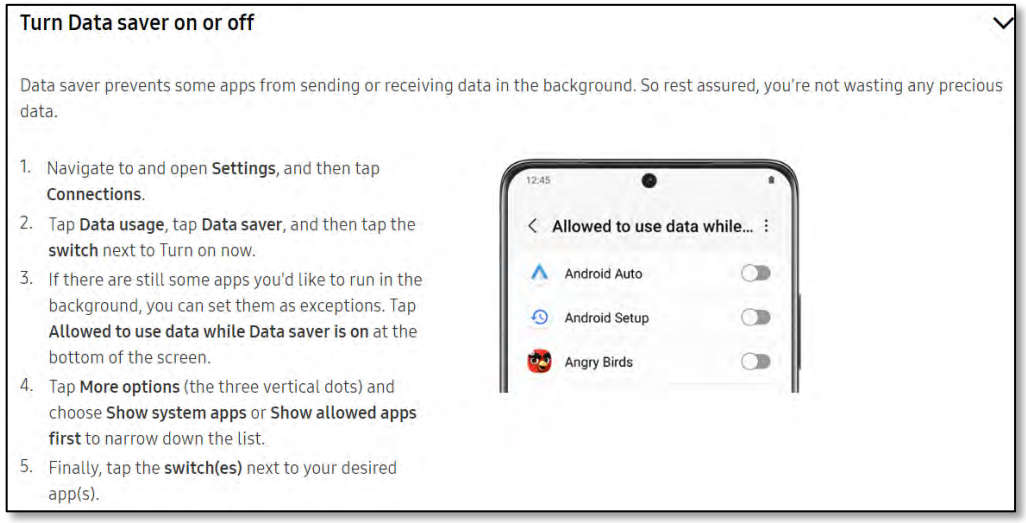
	https://www.apple.com/batteries/maximizing-performance/: **View Battery Usage information** With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery. Here are the messages you may see listed below the apps you've been using: **Background Activity.** This indicates that the battery was used by the app while it was in the background — that is, while you were using another app. • To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely. • If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data.  ; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/; https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks

Claim	Public Documentation
	https://developer.apple.com/documentation/backgroundtasks/bgapprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocessingtask; https://developer.apple.com/documentation/backgroundtasks/bgtask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://www.samsung.com/us/support/answer/ANS00079018/:  ; https://www.samsung.com/us/support/answer/ANS00078987/:

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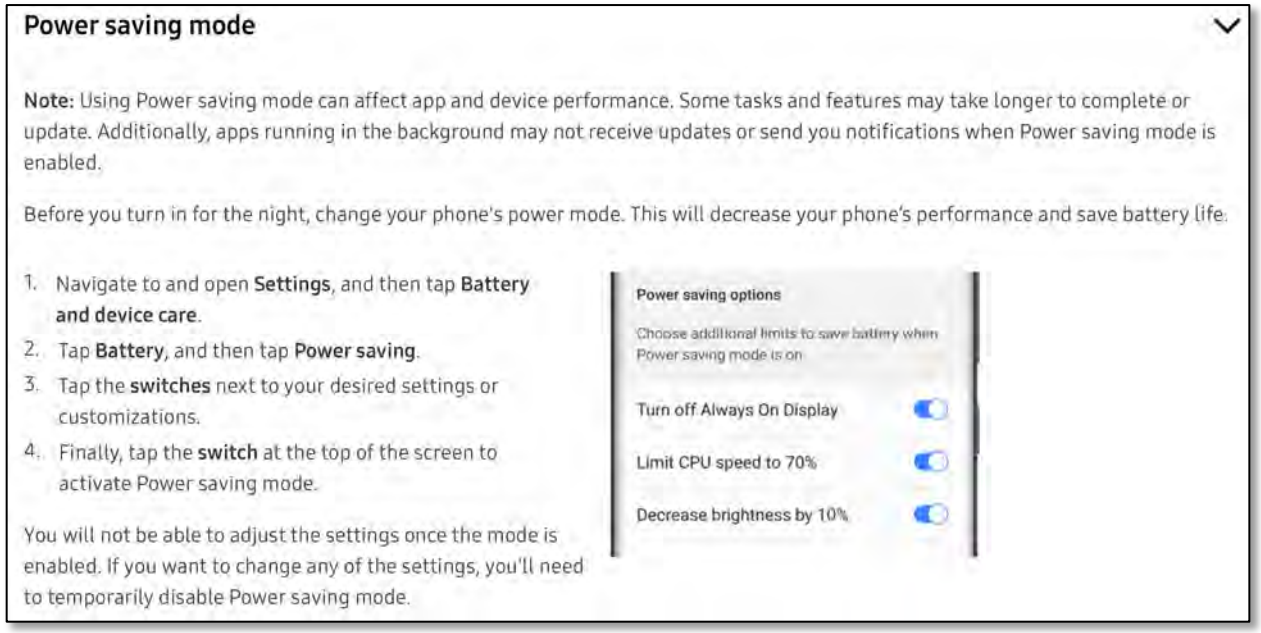
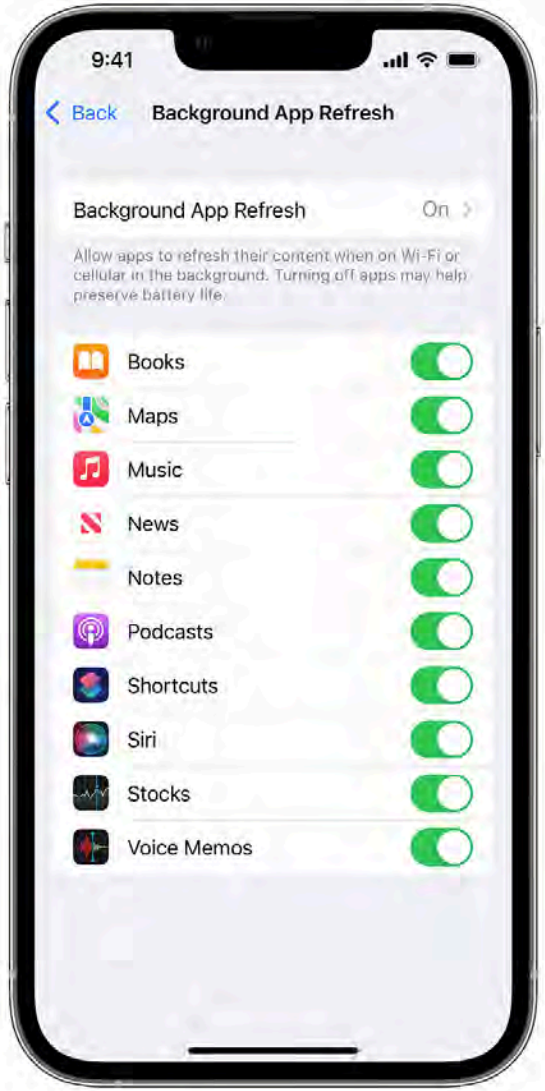
	 ; https://developer.android.com/training/monitoring-device-state/doze-standby; https://developer.android.com/topic/performance/appstandby; https://developer.android.com/topic/performance/power/power-details; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler.
5. The non-transitory computer-readable storage medium recited in claim 1, wherein the one or more prospective or successful communications over the wireless network comprise a communication associated with an image, music, a video, an electronic book, an e-mail attachment, a content or media subscription, a news feed, a	The Accused Instrumentalities comprise the "non-transitory computer-readable storage medium recited in claim 1, wherein the one or more prospective or successful communications over the wireless network comprise a communication associated with an image, music, a video, an electronic book, an e-mail attachment, a content or media subscription, a news feed, a text message, a video chat, or a combination of these." *See*, for example, the disclosures identified for claim 1. As a further example, the Accused Instrumentalities comprise prospective or successful communications by applications or portions of applications (e.g., by "checking for updates and new content") over wireless networks to "refresh in the background," perform "Automatic downloads," "Email fetch," "temporarily pause"

Claim	Public Documentation
text message, a video chat, or a combination of these.	iCloud photos, "prevent[] some apps from sending or receiving data in the background," "apps running in the background may not receive updates," etc. *See, e.g.,* https://support.apple.com/en-us/HT202070: **Use Background App Refresh** After you switch to a different app, some apps run for a short period of time before they're set to a suspended state. Apps that are in a suspended state aren't actively in use, open, or taking up system resources. With Background App Refresh, suspended apps can check for updates and new content. If you want suspended apps to check for new content, go to Settings > General > Background App Refresh and turn on Background App Refresh. If you quit an app from the app switcher, it might not be able to run or check for new content before you open it again. 

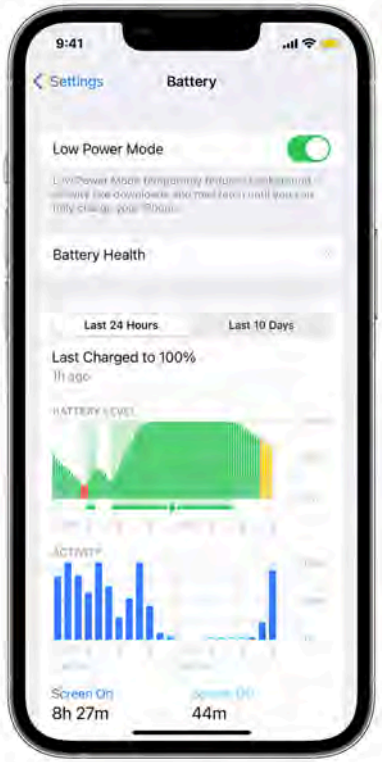
Claim	Public Documentation
	https://support.apple.com/en-us/HT205234:

Use Low Power Mode to save battery life on your iPhone or iPad

Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.



Low Power Mode reduces or affects these features:

- 5G (except for video streaming) on iPhone 12 and iPhone 13 models[1]
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display[2]
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.

1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

Claim	Public Documentation
	https://www.apple.com/batteries/maximizing-performance/: **View Battery Usage information** With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery. Here are the messages you may see listed below the apps you've been using: **Background Activity.** This indicates that the battery was used by the app while it was in the background — that is, while you were using another app. • To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely. • If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data. ; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/; https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks

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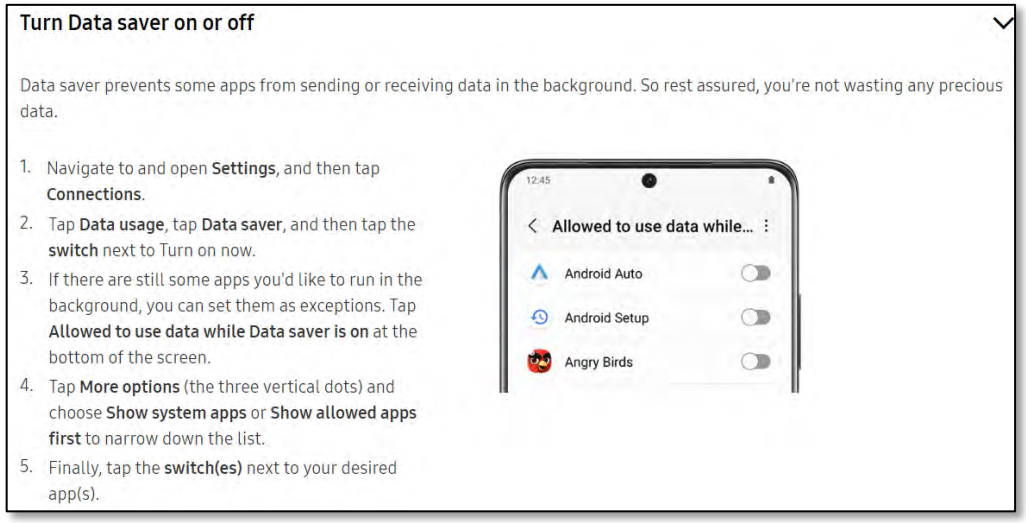
	https://developer.apple.com/documentation/backgroundtasks/bgapprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocessingtask; https://developer.apple.com/documentation/backgroundtasks/bgtask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://www.samsung.com/us/support/answer/ANS00079018/:  ; https://www.samsung.com/us/support/answer/ANS00078987/:

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	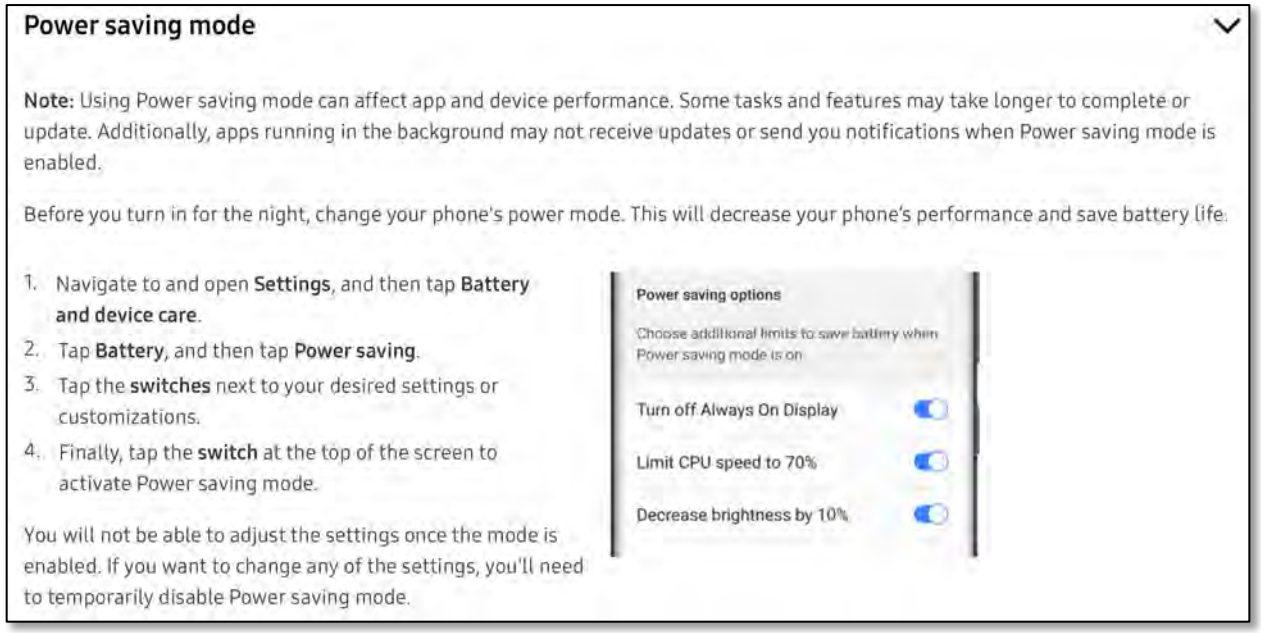 ; https://developer.android.com/training/monitoring-device-state/doze-standby; https://developer.android.com/topic/performance/appstandby; https://developer.android.com/topic/performance/power/power-details; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler.
6. The non-transitory computer-readable storage medium recited in claim 1, wherein the one or more prospective or successful communications over the wireless network comprise a communication associated with a device application or widget, a device operating system function, a file download, streaming media, a	The Accused Instrumentalities comprise the "non-transitory computer-readable storage medium recited in claim 1, wherein the one or more prospective or successful communications over the wireless network comprise a communication associated with a device application or widget, a device operating system function, a file download, streaming media, a software update, a firmware update, a website, a connection to a server, a web browser, or a synchronization service." *See*, for example, the disclosures identified for claim 1.

Claim	Public Documentation
software update, a firmware update, a website, a connection to a server, a web browser, or a synchronization service.	As a further example, the Accused Instrumentalities comprise prospective or successful communications by applications or portions of applications (e.g., by "checking for updates and new content") over wireless networks to "refresh in the background," perform "Automatic downloads," "Email fetch," "temporarily pause" iCloud photos, "prevent[] some apps from sending or receiving data in the background," "apps running in the background may not receive updates," etc. *See, e.g.,* https://support.apple.com/en-us/HT202070:

Claim	Public Documentation
	 https://support.apple.com/en-us/HT205234:

Use Low Power Mode to save battery life on your iPhone or iPad

Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.

Low Power Mode reduces or affects these features:

- 5G (except for video streaming) on iPhone 12 and iPhone 13 models[1]
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display[2]
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- Automatic downloads
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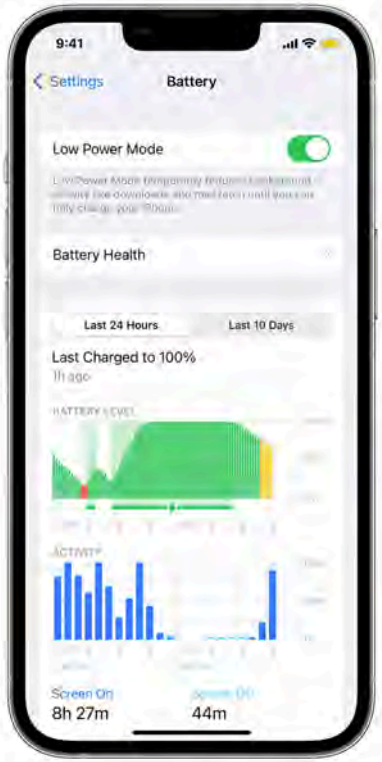
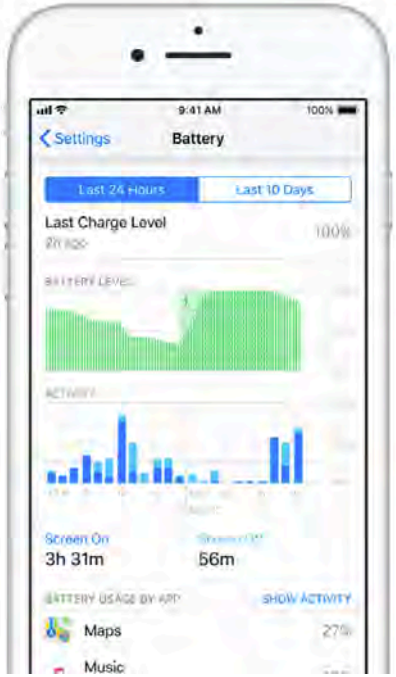
- Background app refresh

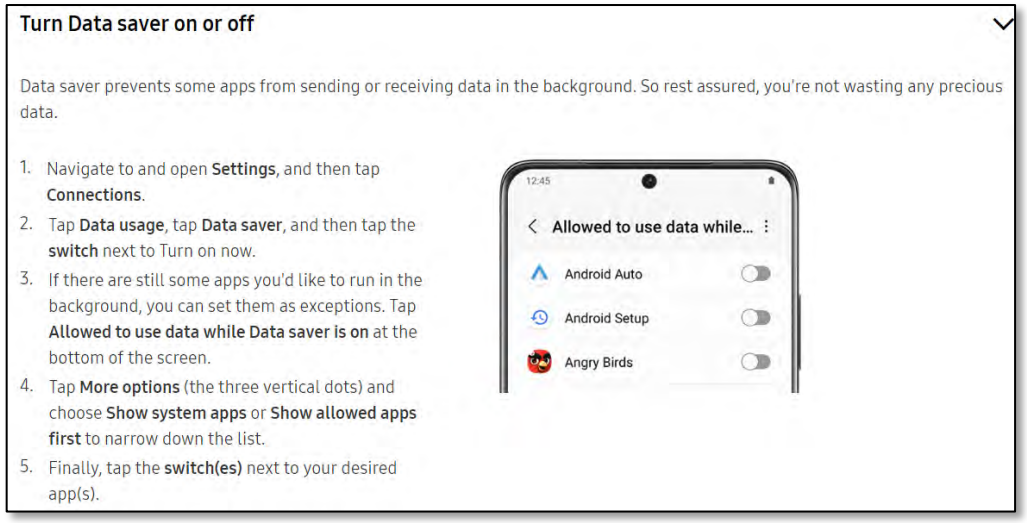
When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.



1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

Claim	Public Documentation
	https://www.apple.com/batteries/maximizing-performance/: **View Battery Usage information** With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery. Here are the messages you may see listed below the apps you've been using: **Background Activity.** This indicates that the battery was used by the app while it was in the background — that is, while you were using another app. • To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely. • If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data.  ; https://developer.apple.com/documentation/avfoundation/avplayer; https://developer.apple.com/documentation/avfoundation/media_playback/configuring_your_app_for_media_playback; https://support.apple.com/en-us/HT207122; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/; https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/;

Claim	Public Documentation
	https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks https://developer.apple.com/documentation/backgroundtasks/bgapprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocessingtask; https://developer.apple.com/documentation/backgroundtasks/bgtask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://www.samsung.com/us/support/answer/ANS00079018/:  ; https://www.samsung.com/us/support/answer/ANS00078987/:

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	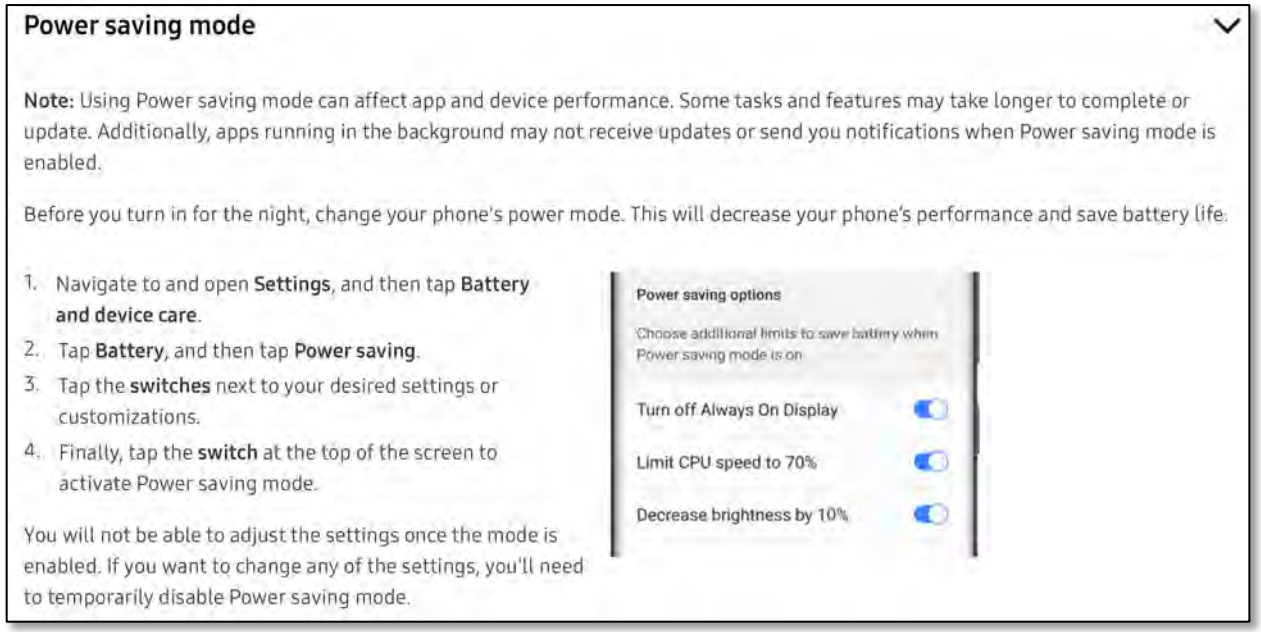 ; https://developer.android.com/guide/topics/media; https://developer.android.com/media; https://developer.android.com/guide/topics/media/platform/mediaplayer; https://www.samsung.com/ie/support/mobile-devices/what-are-widgets-and-how-do-i-add-them-to-my-android-smartphone-or-tablet/; https://developer.android.com/training/monitoring-device-state/doze-standby; https://developer.android.com/topic/performance/appstandby; https://developer.android.com/topic/performance/power/power-details; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler.
7. The non-transitory computer-readable storage medium recited in claim 1, wherein identify a service usage activity of the wireless end-user device comprises identify an intention to launch or start the first software component.	The Accused Instrumentalities comprise the "non-transitory computer-readable storage medium recited in claim 1, wherein identify a service usage activity of the wireless end-user device comprises identify an intention to launch or start the first software component." *See*, for example, the disclosures identified for claim 1.

Claim	Public Documentation
	As a further example, the Accused Instrumentalities comprise identifying an intention to launch or start the first software component. *See, e.g.*, https://www.t-mobile.com/support/public-files/attachments/samsung/samsung-galaxy-s21-fe-5g/Samsung%20Galaxy%20S21%20FE%205G_English%20User%20Guide_FINAL2.pdf: Data usage Check your current mobile and Wi-Fi data usage. You can also customize warnings and limits. ○ From Settings, tap Connections > Data usage. Turn on Data saver Use Data saver to reduce your data consumption by preventing selected apps from sending or receiving data in the background. 1. From Settings, tap Connections > Data usage > Data saver. 2. Tap to turn on Data saver. • To allow some apps to have unrestricted data usage, tap **Allowed to use data while Data saver is on**, and tap next to each app to specify restrictions. ;https://www.samsung.com/us/support/answer/ANS00079018/:

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	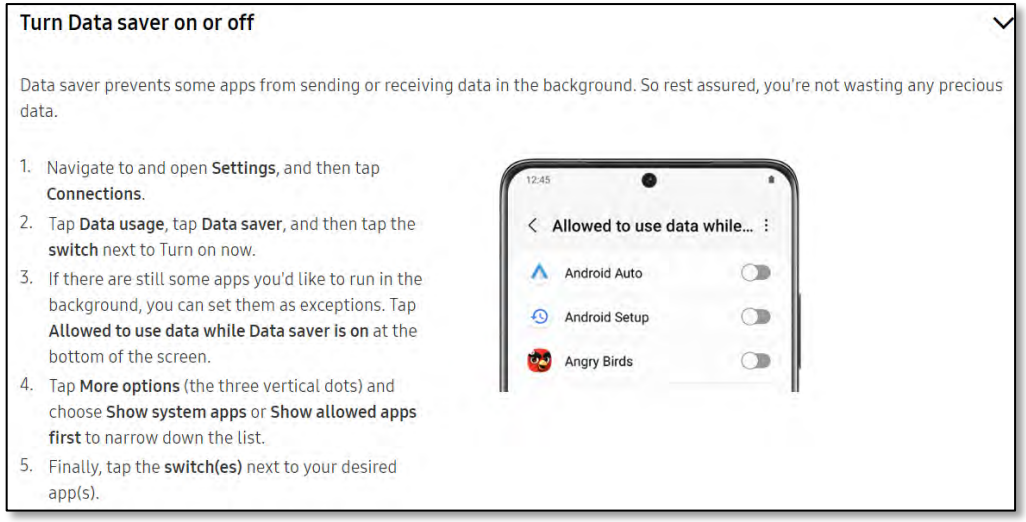 ; https://www.samsung.com/ae/support/mobile-devices/android-pie-what-is-the-data-saver-feature/:

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	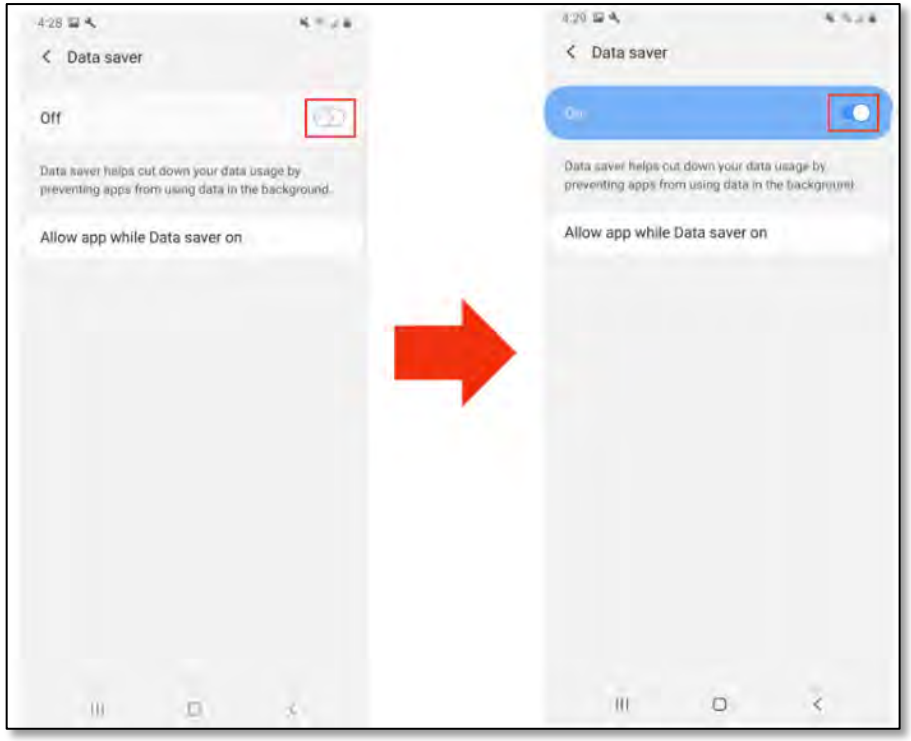

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	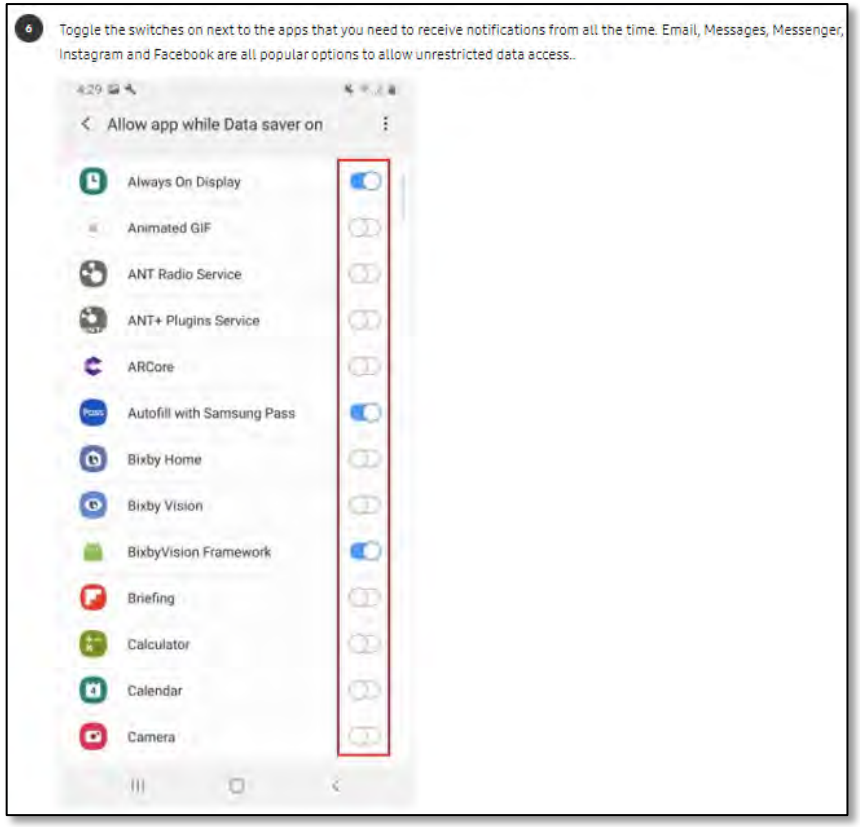 ; https://www.samsung.com/us/support/answer/ANS00078987/:

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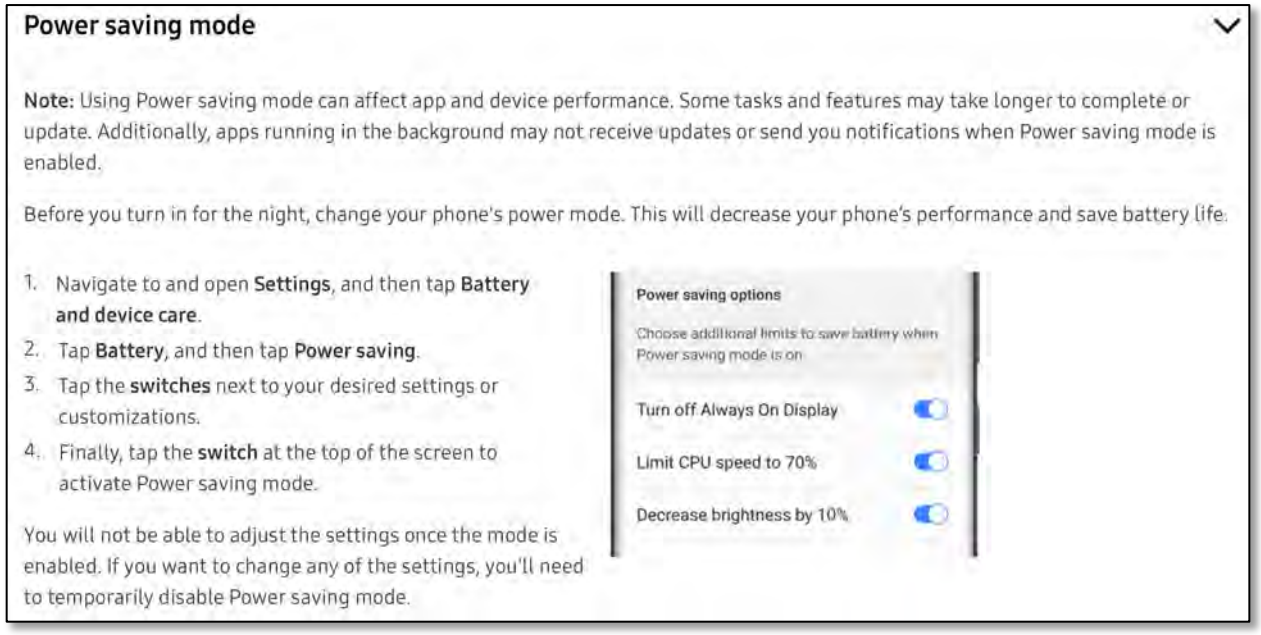
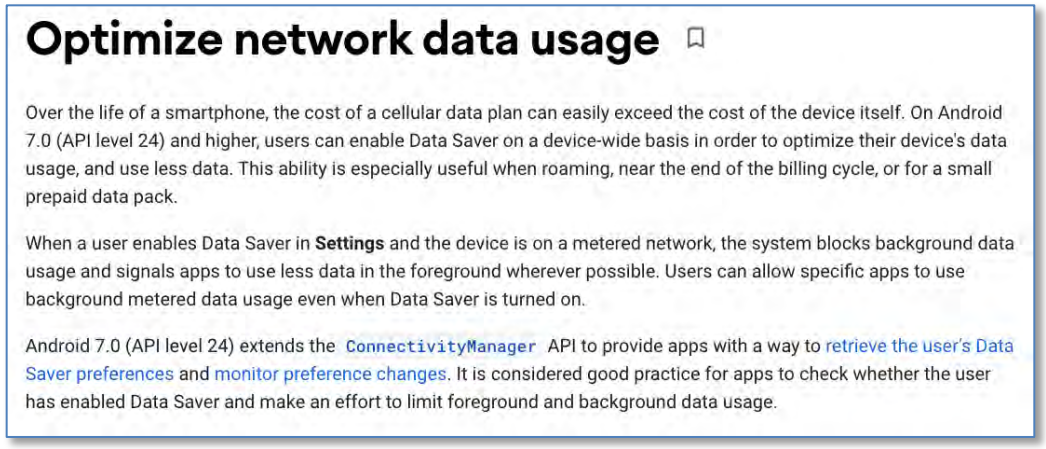
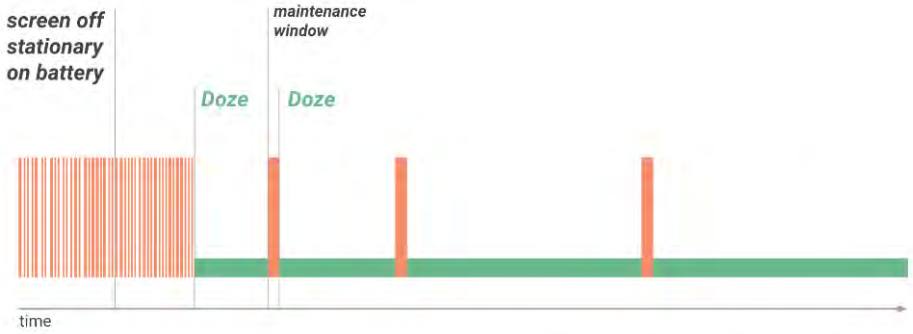
	 ; https://developer.android.com/training/basics/network-ops/data-saver: 

Claim	Public Documentation

	Check data saver preferences
	On Android 7.0 (API level 24) and higher, apps can use the `ConnectivityManager` API to determine what data usage restrictions are being applied. The `getRestrictBackgroundStatus()` method returns one of the following values:
	`RESTRICT_BACKGROUND_STATUS_DISABLED`
	Data Saver is disabled.
	`RESTRICT_BACKGROUND_STATUS_ENABLED`
	The user has enabled Data Saver for this app. Apps should make an effort to limit data usage in the foreground and gracefully handle restrictions to background data usage.
	`RESTRICT_BACKGROUND_STATUS_WHITELISTED`
	The user has enabled Data Saver but the app is allowed to bypass it. Apps should still make an effort to limit foreground and background data usage.
	Limit data usage whenever the device is connected to a metered network, even if Data Saver is disabled or the app is allowed to bypass it. The following sample code uses `ConnectivityManager.isActiveNetworkMetered()` and `ConnectivityManager.getRestrictBackgroundStatus()` to determine how much data the app should use:
	; https://developer.android.com/training/monitoring-device-state/doze-standby:
	Optimize for Doze and App Standby
	Starting from Android 6.0 (API level 23), Android introduces two power-saving features that extend battery life for users by managing how apps behave when a device is not connected to a power source. *Doze* reduces battery consumption by deferring background CPU and network activity for apps when the device is unused for long periods of time. *App Standby* defers background network activity for apps with which the user has not recently interacted.
	While the device is in Doze, apps' access to certain battery-intensive resources is deferred until maintenance windows. The specific restrictions are listed in Power Management Restrictions.
	Doze and App Standby manage the behavior of all apps running on Android 6.0 or higher, regardless whether they are specifically targeting API level 23. To ensure the best experience for users, test your app in Doze and App Standby modes and make any necessary adjustments to your code. The sections below provide details.

Claim	Public Documentation
	Understanding Doze If a user leaves a device unplugged and stationary for a period of time, with the screen off, the device enters Doze mode. In Doze mode, the system attempts to conserve battery by restricting apps' access to network and CPU-intensive services. It also prevents apps from accessing the network and defers their jobs, syncs, and standard alarms. Periodically, the system exits Doze for a brief time to let apps complete their deferred activities. During this *maintenance window*, the system runs all pending syncs, jobs, and alarms, and lets apps access the network.  **Figure 1.** Doze provides a recurring maintenance window for apps to use the network and handle pending activities. At the conclusion of each maintenance window, the system again enters Doze, suspending network access and deferring jobs, syncs, and alarms. Over time, the system schedules maintenance windows less and less frequently, helping to reduce battery consumption in cases of longer-term inactivity when the device is not connected to a charger. As soon as the user wakes the device by moving it, turning on the screen, or connecting a charger, the system exits Doze and all apps return to normal activity. The Doze restriction on network access is also likely to affect your app, especially if the app relies on real-time messages such as tickles or notifications. If your app requires a persistent connection to the network to receive messages, you should use Firebase Cloud Messaging (FCM) if possible. ; https://developer.android.com/topic/performance/appstandby:

App Standby Buckets

Android 9 (API level 28) and higher support **App Standby Buckets**. App Standby Buckets help the system prioritize apps' requests for resources based on how recently and how frequently the apps are used. Based on app usage patterns, each app is placed in one of five priority **buckets**. The system limits the device resources available to each app based on which bucket the app is in.

Priority buckets

The system dynamically assigns each app to a priority bucket, reassigning the apps as needed. The system may rely on a preloaded app that uses machine learning to determine how likely each app is to be used, and assigns apps to the appropriate buckets. If the system app is not present on a device, the system defaults to sorting apps based on how recently they were used. More active apps are assigned to buckets that give the apps higher priority, making more system resources available to the app. In particular, the bucket determines how frequently the app's jobs run, and how often the app can trigger alarms. These restrictions apply only while the device is on battery power; the system does not impose these restrictions on apps while the device is charging.

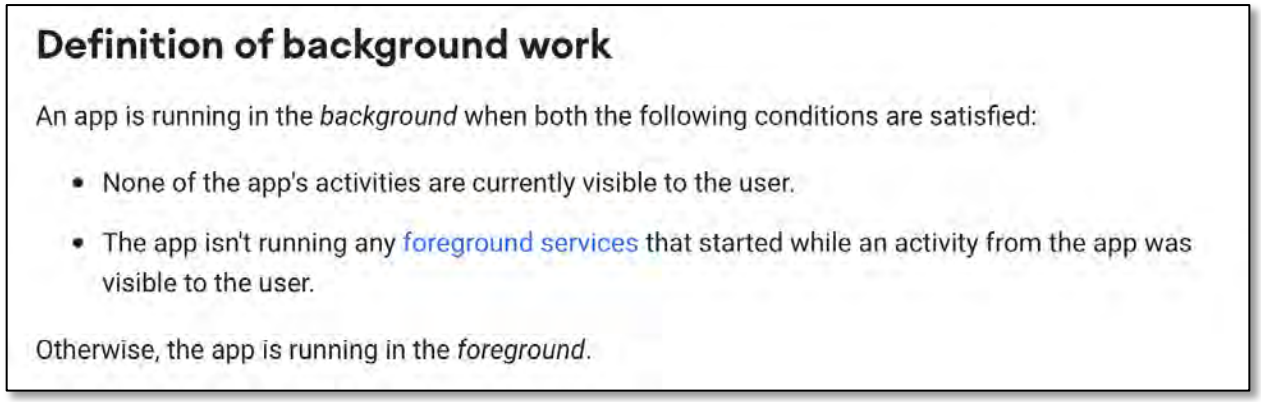
Note: Every manufacturer can set their own criteria for how non-active apps are assigned to buckets. You should not try to influence which bucket your app is assigned to. Instead, focus on making sure your app behaves well in whatever bucket it might be in. Your app can find out what bucket it's currently in by calling `UsageStatsManager.getAppStandbyBucket()`.

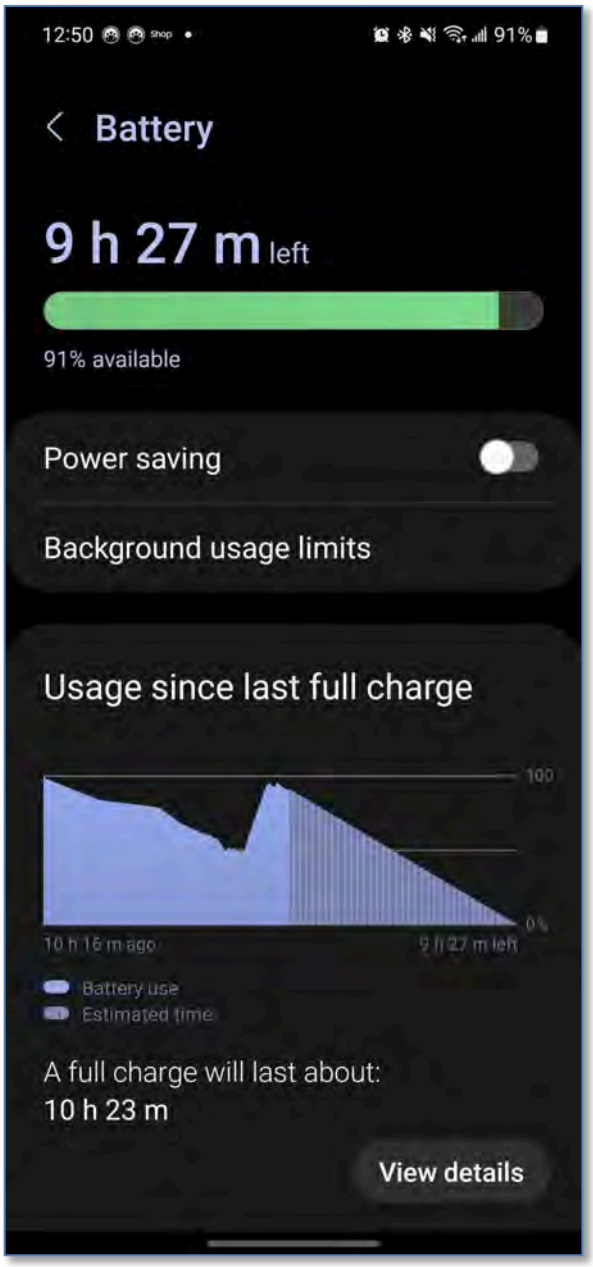
The buckets are:

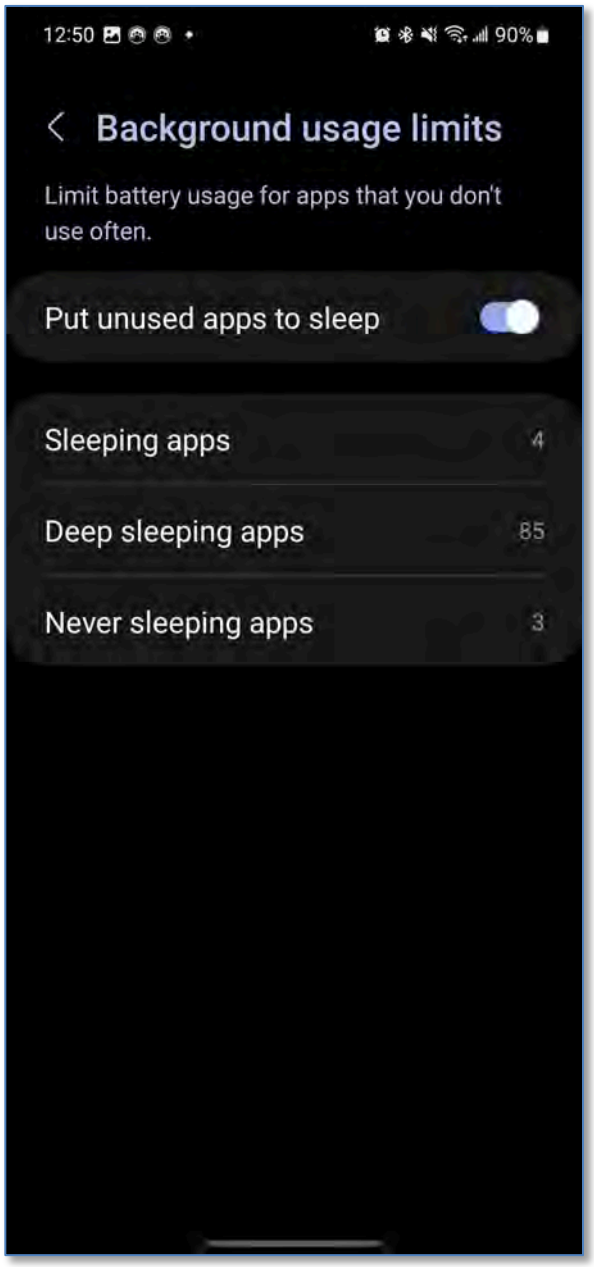
1. Active: App is currently being used or was very recently used.
2. Working set: App is in regular use.
3. Frequent: App is often used, but not every day.
4. Rare: App is not frequently used.
5. Restricted: App consumes a great deal of system resources, or may exhibit undesirable behavior.

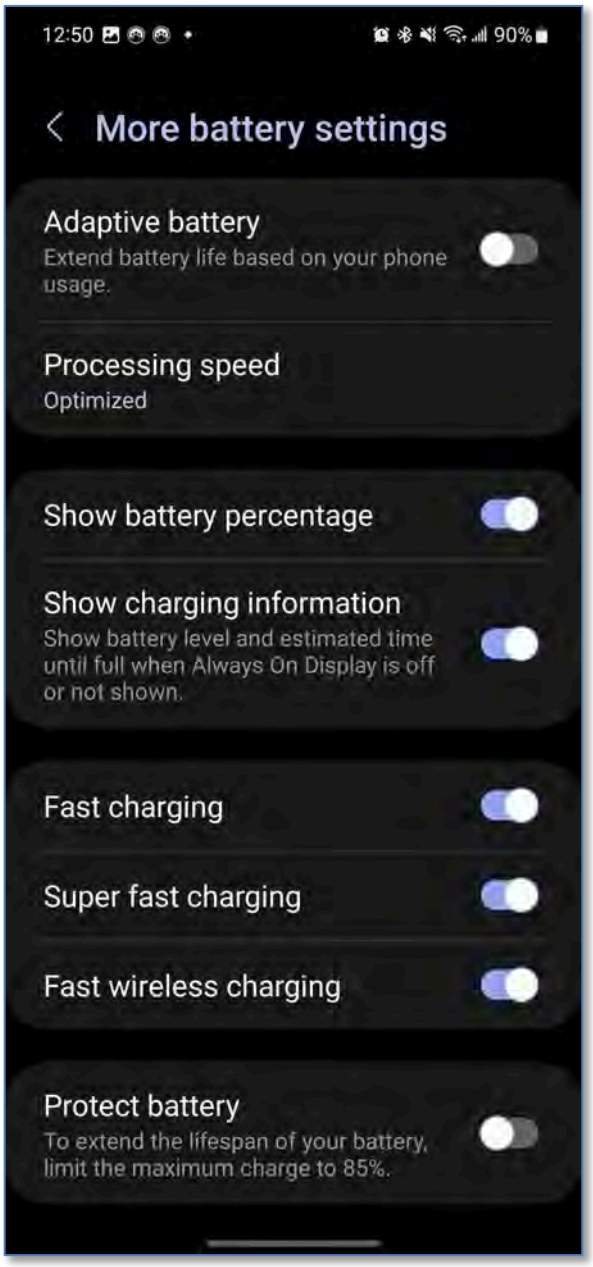
In addition, there's a special **never** bucket for apps that have been installed but have never been run. The system imposes severe restrictions on these apps.

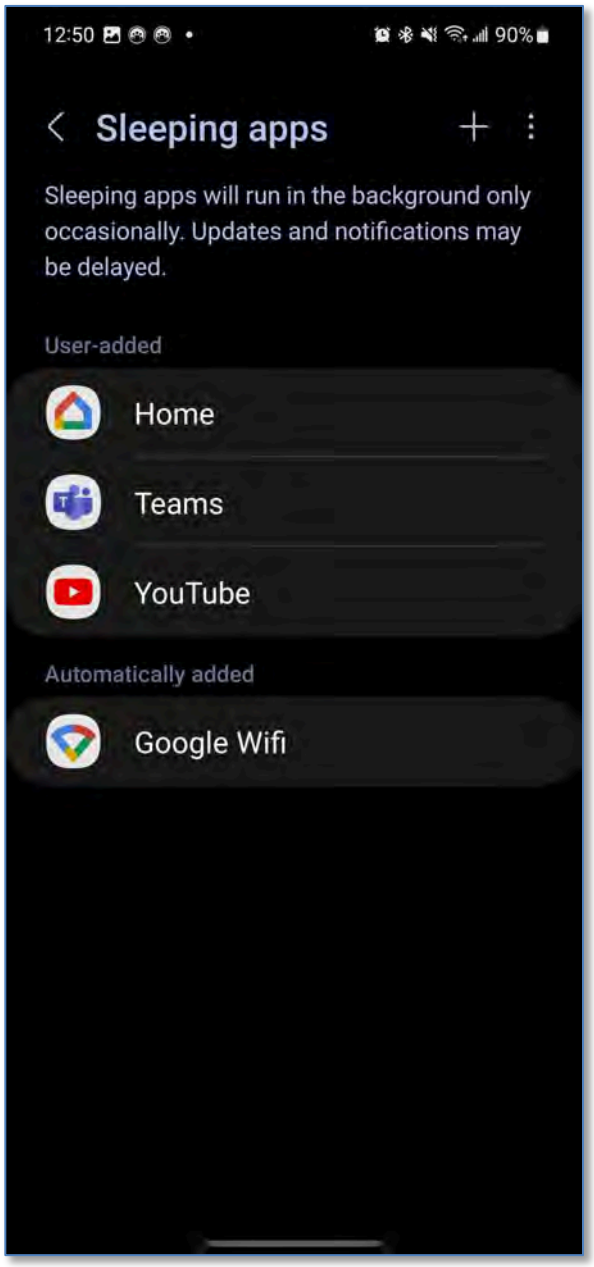
Claim	Public Documentation
	; https://developer.android.com/topic/performance/power/power-details; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler; https://developer.android.com/guide/background/persistent; https://developer.android.com/guide/components/activities/process-lifecycle: 1. A **foreground process** is one that is required for what the user is currently doing. Various application components can cause its containing process to be considered foreground in different ways. A process is considered to be in the foreground if any of the following conditions hold: • It is running an `Activity` at the top of the screen that the user is interacting with (its `onResume()` method has been called). • It has a `BroadcastReceiver` that is currently running (its `BroadcastReceiver.onReceive()` method is executing). • It has a `Service` that is currently executing code in one of its callbacks (`Service.onCreate()`, `Service.onStart()`, or `Service.onDestroy()`). There will only ever be a few such processes in the system, and these will only be killed as a last resort if memory is so low that not even these processes can continue to run. Generally, at this point, the device has reached a memory paging state, so this action is required in order to keep the user interface responsive. ; https://developer.android.com/guide/background:

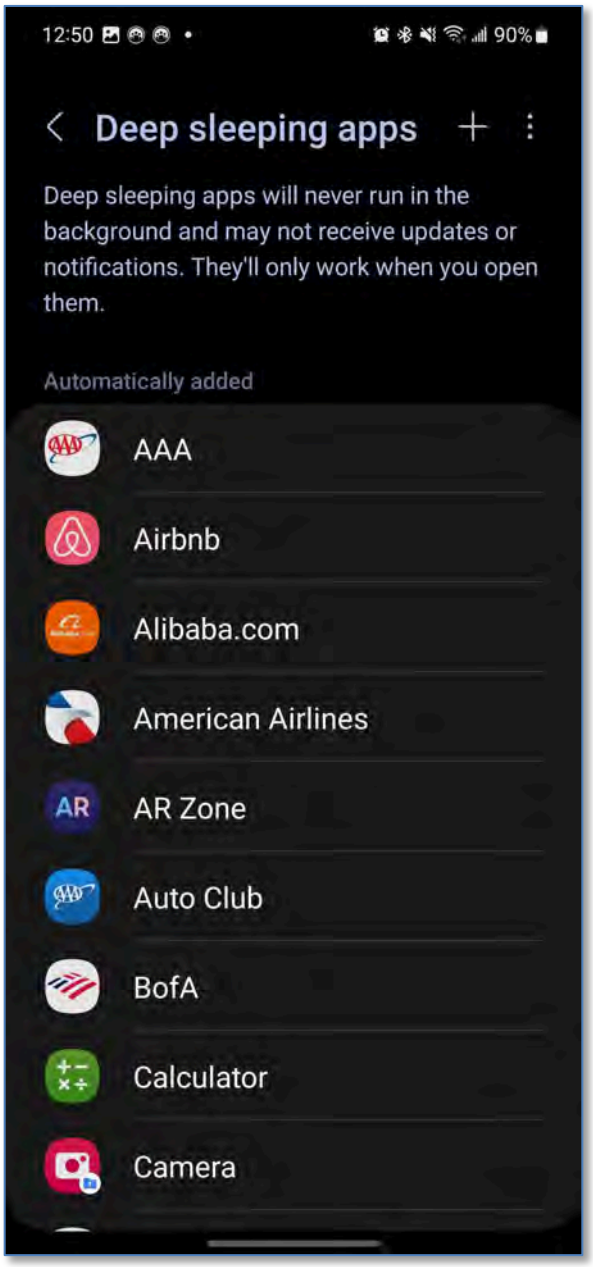
Claim	Public Documentation
	 *see also* the exemplary screenshots below:

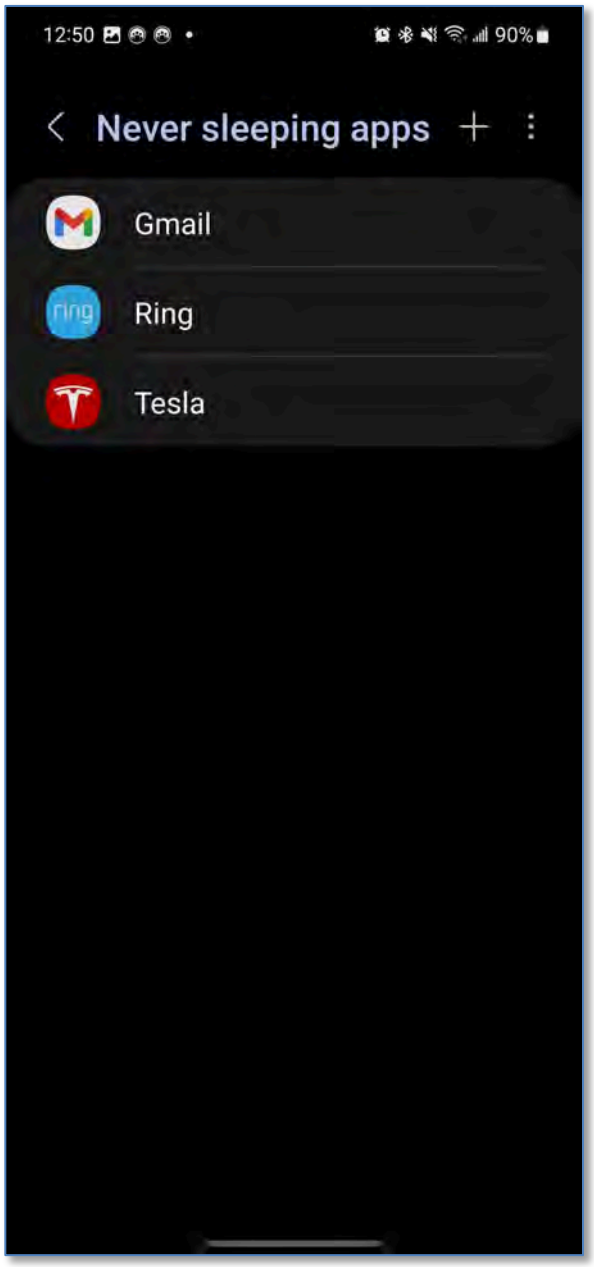

12:50
91%
Battery
9 h 27 m left
91% available
Power saving
Background usage limits
Usage since last full charge
100
0%
10 h 16 m ago
9 h 27 m left
Battery use
Estimated time
A full charge will last about:
10 h 23 m
View details

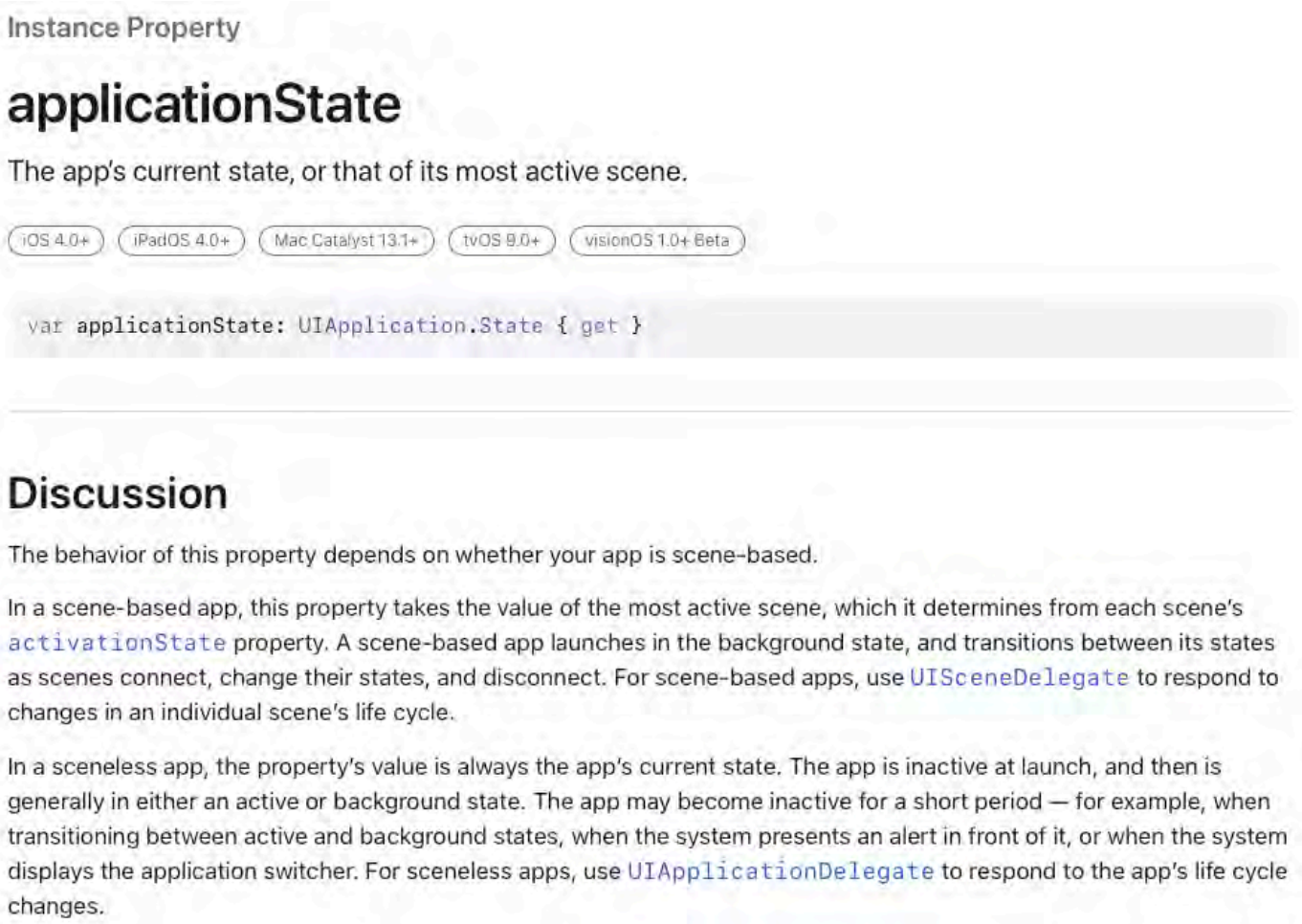

12:50
90%
Background usage limits
Limit battery usage for apps that you don't use often.
Put unused apps to sleep
Sleeping apps 4
Deep sleeping apps 85
Never sleeping apps 3


12:50
90%
More battery settings
Adaptive battery
Extend battery life based on your phone usage.
Processing speed
Optimized
Show battery percentage
Show charging information
Show battery level and estimated time until full when Always On Display is off or not shown.
Fast charging
Super fast charging
Fast wireless charging
Protect battery
To extend the lifespan of your battery, limit the maximum charge to 85%.

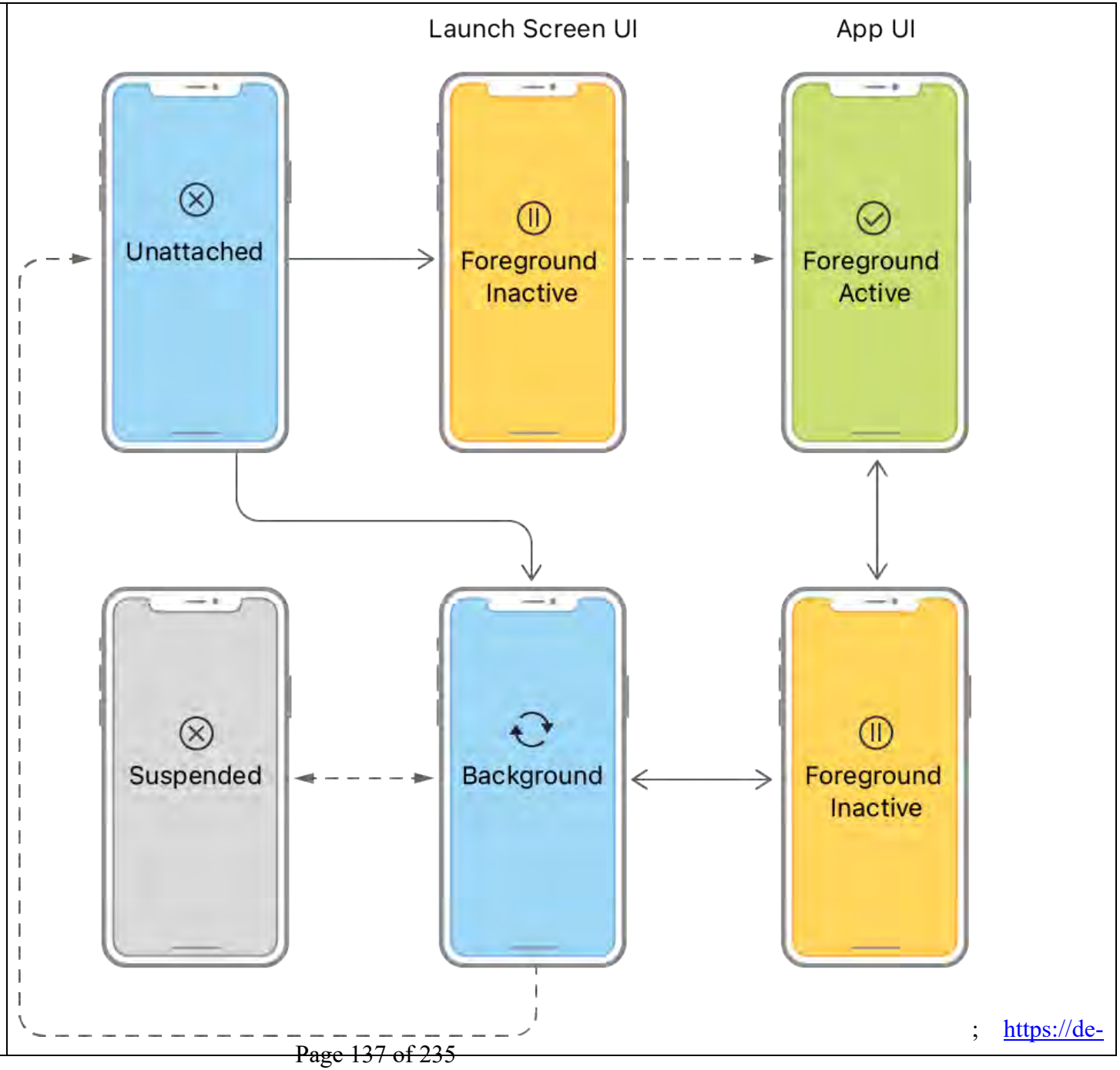

12:50
90%
Sleeping apps
Sleeping apps will run in the background only occasionally. Updates and notifications may be delayed.
User-added
Home
Teams
YouTube
Automatically added
Google Wifi


12:50
90%
Deep sleeping apps
Deep sleeping apps will never run in the background and may not receive updates or notifications. They'll only work when you open them.
Automatically added
AAA
Airbnb
Alibaba.com
American Airlines
AR Zone
Auto Club
BofA
Calculator
Camera

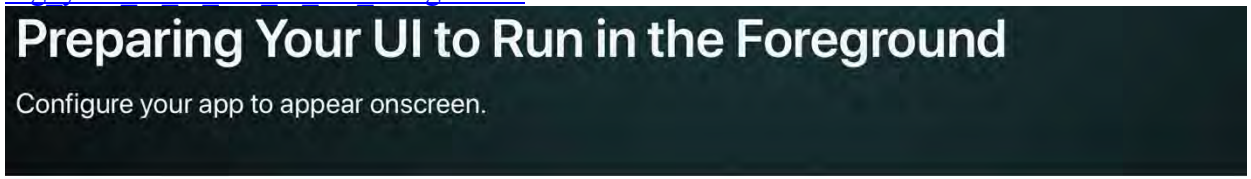

12:50
90%
Never sleeping apps
Gmail
Ring
Tesla

Claim	Public Documentation
	See also, e.g., https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate:  Instance Property **applicationState** The app's current state, or that of its most active scene. iOS 4.0+ iPadOS 4.0+ Mac Catalyst 13.1+ tvOS 9.0+ visionOS 1.0+ Beta `var applicationState: UIApplication.State { get }` **Discussion** The behavior of this property depends on whether your app is scene-based. In a scene-based app, this property takes the value of the most active scene, which it determines from each scene's `activationState` property. A scene-based app launches in the background state, and transitions between its states as scenes connect, change their states, and disconnect. For scene-based apps, use `UISceneDelegate` to respond to changes in an individual scene's life cycle. In a sceneless app, the property's value is always the app's current state. The app is inactive at launch, and then is generally in either an active or background state. The app may become inactive for a short period — for example, when transitioning between active and background states, when the system presents an alert in front of it, or when the system displays the application switcher. For sceneless apps, use `UIApplicationDelegate` to respond to the app's life cycle changes. ; https://developer.apple.com/documentation/uikit/app_and_environment/managing_your_app_s_life_cycle:

Claim	Public Documentation
	 ## Overview The current state of your app determines what it can and cannot do at any time. For example, a foreground app has the user's attention, so it has priority over system resources, including the CPU. By contrast, a background app must do as little work as possible, and preferably nothing, because it is offscreen. As your app changes from state to state, you must adjust its behavior accordingly.

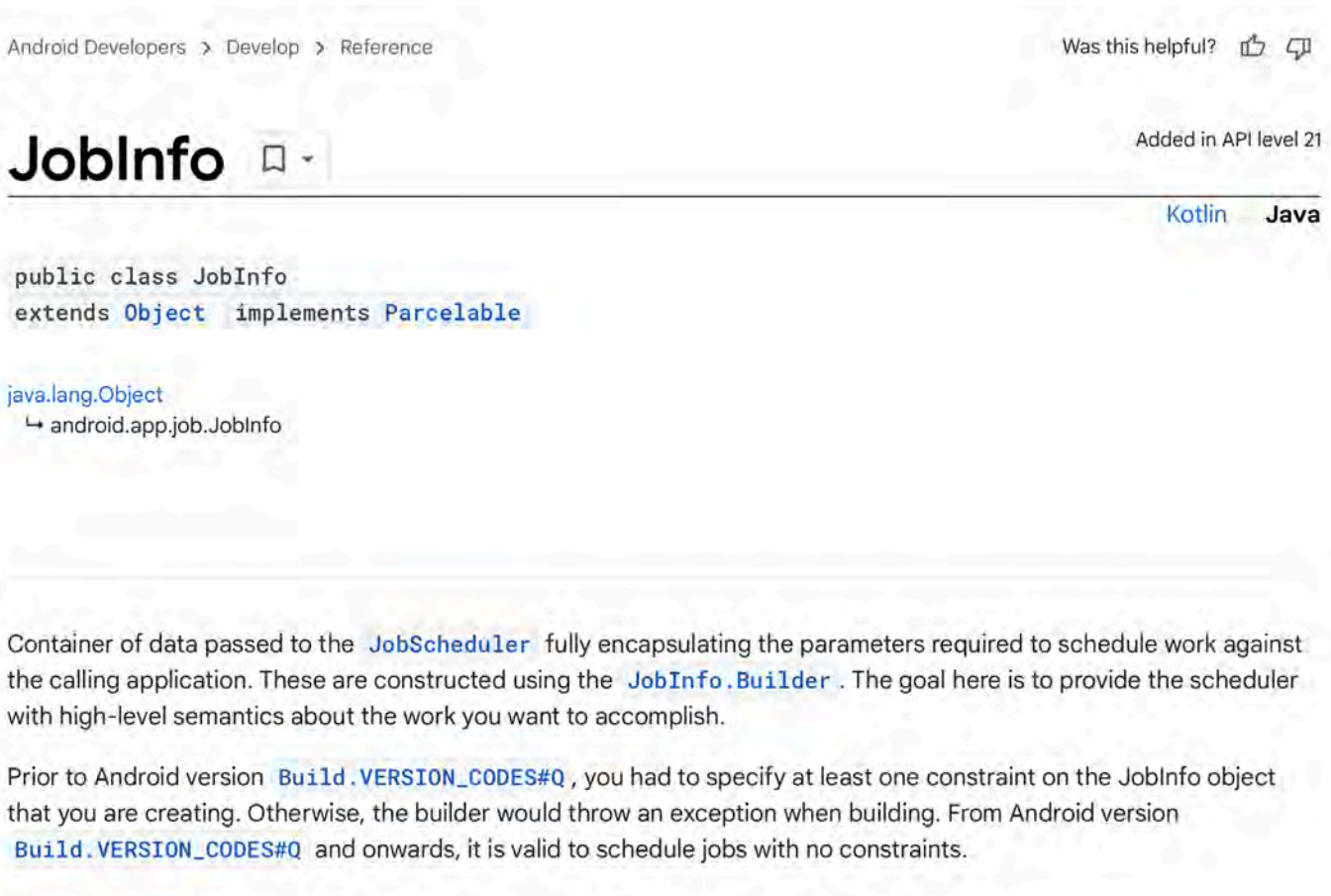

Launch Screen UI
App UI
Unattached
Foreground Inactive
Foreground Active
Suspended
Background
Foreground Inactive

; https://de-

Claim	Public Documentation
	veloper.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_foreground/:  **Overview** Use foreground transitions to prepare your app's UI to appear onscreen. An app's transition to the foreground is usually in response to a user action. For example, when the user taps the app's icon, the system launches the app and brings it to the foreground. Use a foreground transition to update your app's UI, acquire resources, and start the services you need to handle user requests.

Claim	Public Documentation
	Configure Your User Interface and Initial Tasks at Activation The system moves your app to the active state immediately before displaying the app's UI. Activation is a good time to configure your app's UI and runtime behavior; specifically: • Show your app's windows, if needed. • Change the currently visible view controller, if needed. • Update the data values and state of views and controls. • Display controls to resume a paused game. • Start or resume any dispatch queues that you use to execute tasks. • Update data source objects. • Start timers for periodic tasks. Put your configuration code in one of the following methods: • For a scene-based UI—The `sceneDidBecomeActive(_:)` method of the appropriate scene delegate object. • For all other apps—The `applicationDidBecomeActive(_:)` method of your app delegate object. Activation is also the time to put finishing touches on your UI before displaying it to the user. Don't run any code that might block your activation method. Instead, make sure you have everything you need in advance. For example, if your data changes frequently outside of the app, use background tasks to fetch updates from the network before your app returns to the foreground. Otherwise, be prepared to display existing data while you fetch changes asynchronously.
8. The non-transitory computer-readable storage medium recited in claim 1, wherein identify a service usage activity of the wireless end-user device comprises identify: an application identifier associated with the service usage activity or the first software component, an operating system function identifier associated with the	The Accused Instrumentalities comprise the "non-transitory computer-readable storage medium recited in claim 1, wherein identify a service usage activity of the wireless end-user device comprises identify: an application identifier associated with the service usage activity or the first software component, an operating system function identifier associated with the service usage activity or the first software component, an aggregate service activity identifier, a component service activity identifier, or a combination of these." *See*, for example, the disclosures identified for claims 1-6. As a further example, the Accused Instrumentalities comprise application identifiers, processes, delegates, objects, scenes, task identifiers, etc. *See, e.g.,* https://developer.android.com/build/configure-app-module:

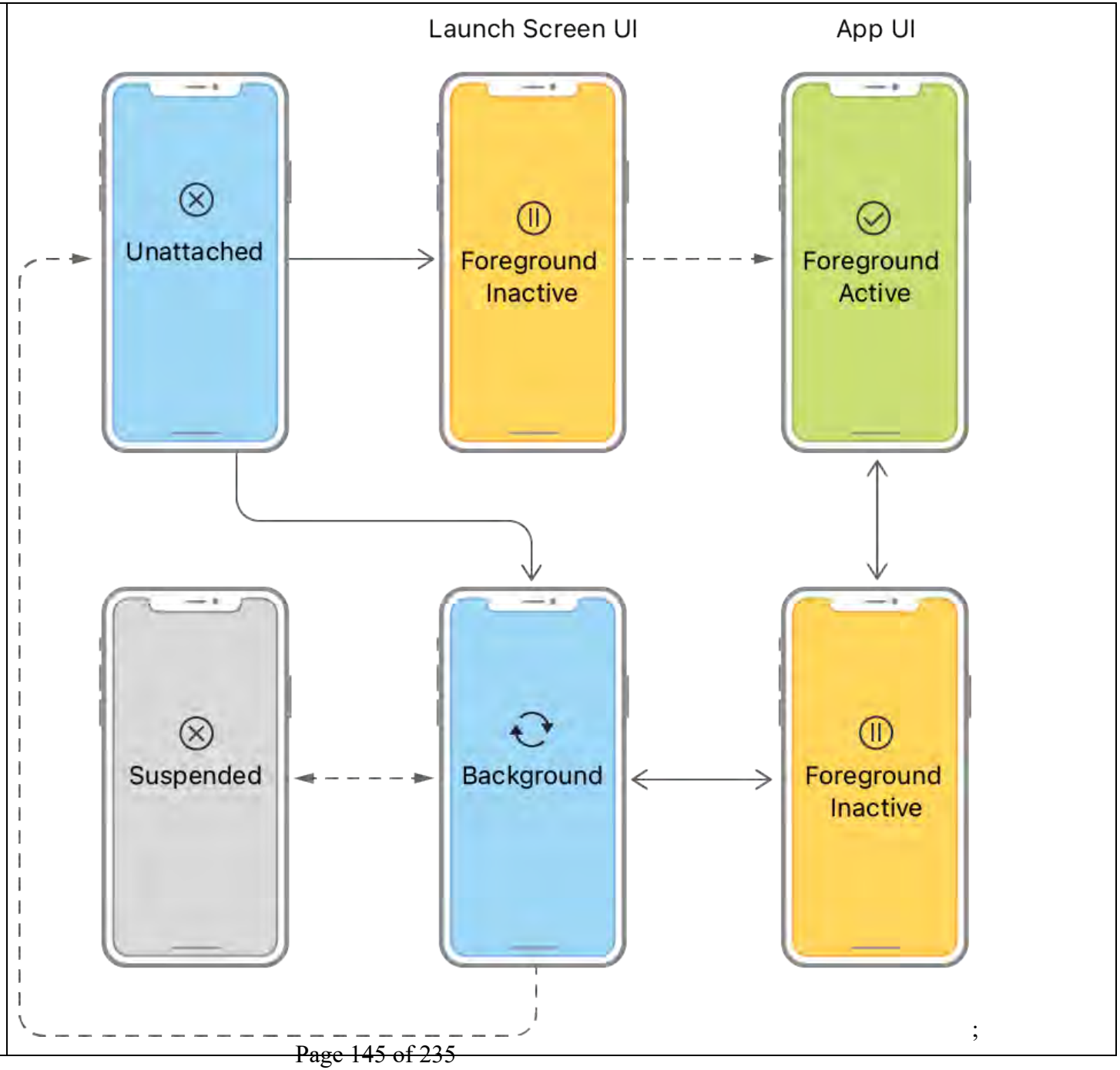
Claim	Public Documentation
service usage activity or the first software component, an aggregate service activity identifier, a component service activity identifier, or a combination of these.	**Set the application ID** Every Android app has a unique application ID that looks like a Java or Kotlin package name, such as *com.example.myapp*. This ID uniquely identifies your app on the device and in the Google Play Store. **Important:** Once you publish your app, you should never change the application ID. If you change the application ID, Google Play Store treats the upload as a completely different app. If you want to upload a new version of your app, you must use the same application ID and signing certificate as when originally published. ; https://developer.android.com/reference/android/app/job/JobInfo:

Claim	Public Documentation
	

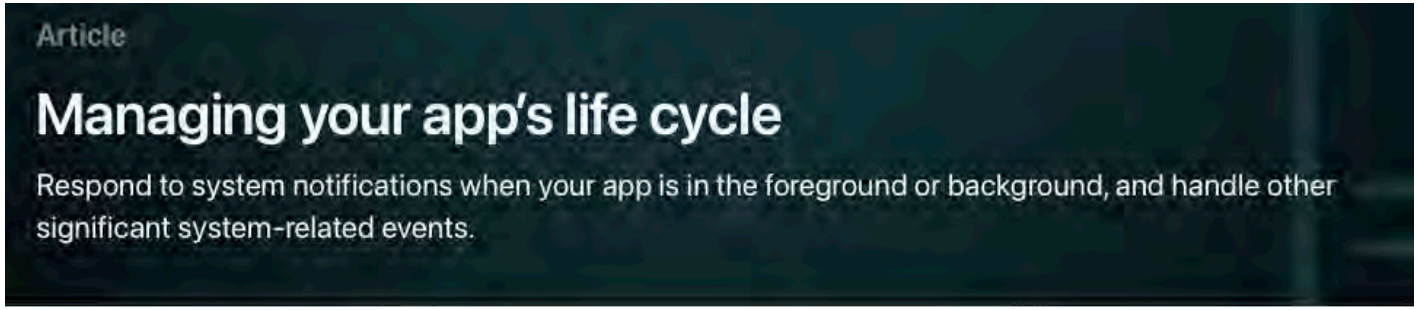
Claim	Public Documentation
	getId Added in API level 21 `public int getId ()` Unique job id associated with this application (uid). This is the same job ID you supplied in the `Builder` constructor. ; https://developer.android.com/guide/components/services; https://developer.apple.com/help/account/manage-identifiers/register-an-app-id/: Manage identifiers Register an App ID An *App ID* identifies your app in a provisioning profile. It is a two-part string used to identify one or more apps from a single development team. There are two types of App IDs: an explicit App ID, used for a single app, and a wildcard App ID, used for a set of apps. The app capabilities enabled for an App ID serve as an allow list of the capabilities one or more apps may use. You can enable app capabilities when you create an App ID or modify these settings later. In-App Purchase is enabled by default for an explicit App ID. Beginning with Xcode 11.4, a single App ID can be used to build iOS, macOS, tvOS, and watchOS apps. ***Note:*** In order to configure the capabilities an app uses, you need to add them to a target in the Xcode project.

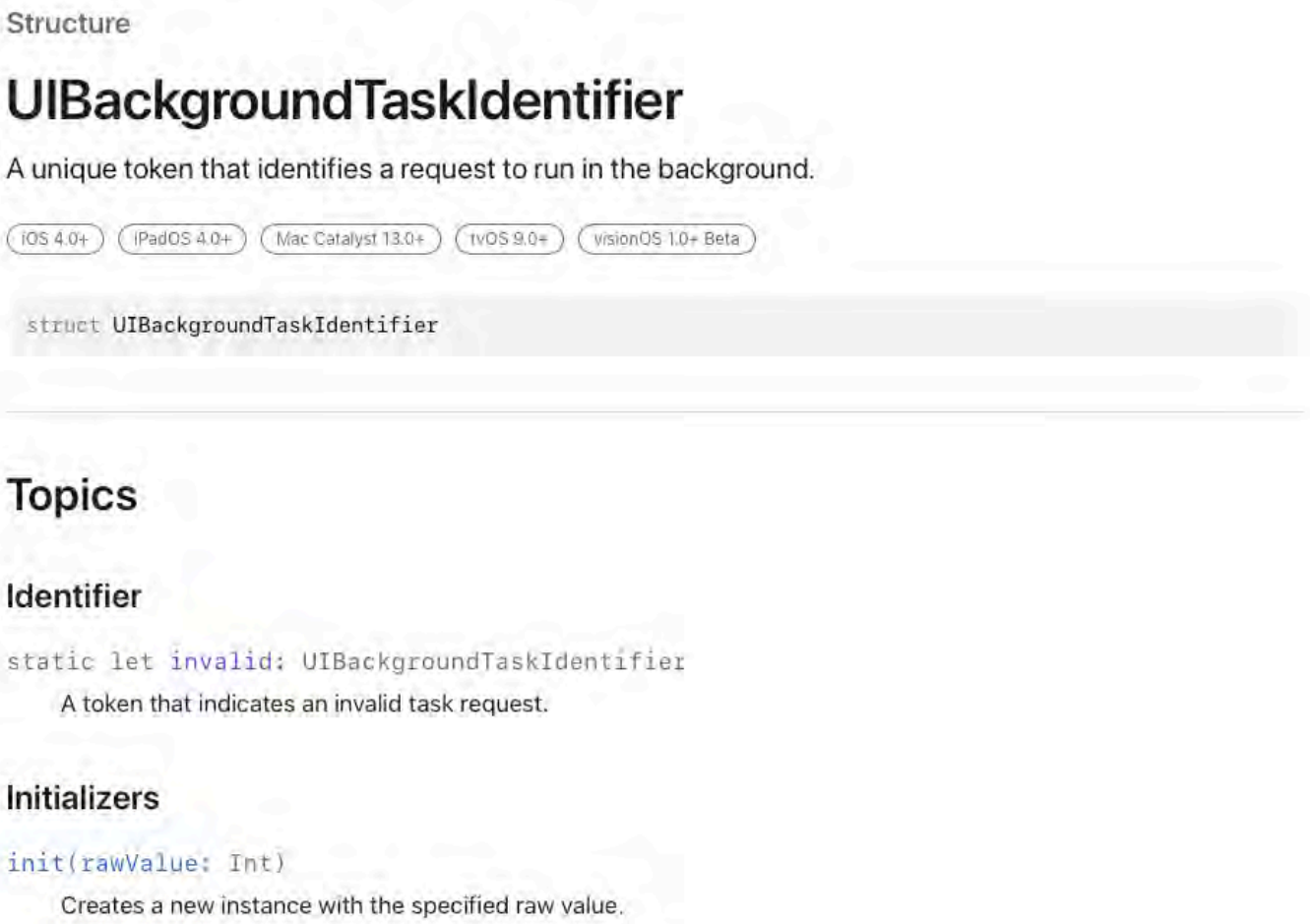
Claim	Public Documentation
	1. In Certificates, Identifiers & Profiles, click Identifiers in the sidebar, then click the add button (+) on the top left. 2. Select App IDs from the list of options and click continue. 3. From the options, confirm App ID type is automatically selected, then click Continue. 4. Enter a name or description for the App ID in the Description field. 5. To create an explicit App ID, select Explicit App ID and enter the app's bundle ID in the Bundle ID field. The explicit App ID you enter here should match the bundle ID you entered in the target's Summary pane in Xcode. 6. To create a wildcard App ID, select Wildcard App ID and enter a bundle ID suffix in the Bundle ID field. 7. Select the corresponding checkboxes to enable the app capabilities you want to use. The capabilities available to your type of app and program membership appear under Capabilities. A checkbox is disabled if the technology requires an explicit App ID and you're creating a wildcard App ID, or the technology is enabled by default. Not all capabilities are eligible for all platforms. 8. Click Continue, then review the registration information, then click Register. ; https://developer.apple.com/help/account/manage-identifiers/register-an-app-id-for-app-clips; https://developer.apple.com/help/account/manage-identifiers/register-a-services-id; https://developer.apple.com/help/account/manage-identifiers/register-an-app-group; https://developer.apple.com/help/account/manage-identifiers/create-an-icloud-container; https://developer.apple.com/documentation/uikit/app_and_environment/managing_your_app_s_life_cycle:

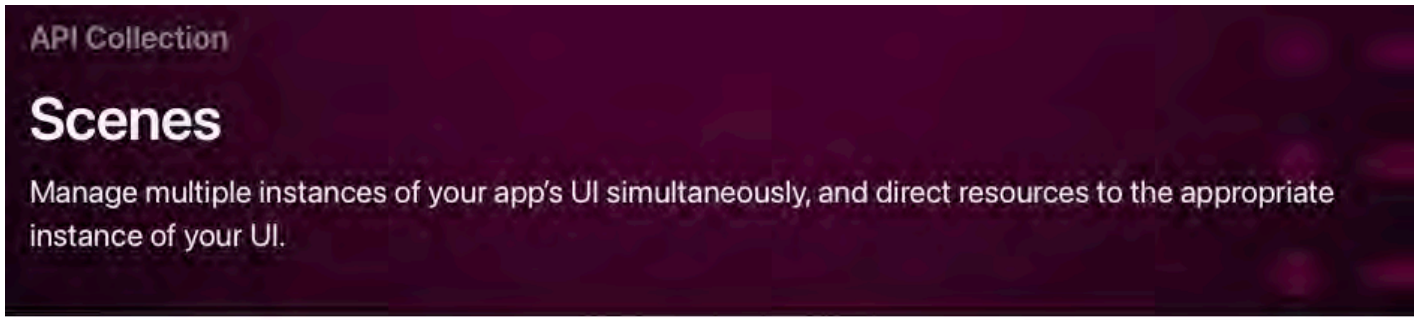
Claim	Public Documentation
	 ## Overview The current state of your app determines what it can and cannot do at any time. For example, a foreground app has the user's attention, so it has priority over system resources, including the CPU. By contrast, a background app must do as little work as possible, and preferably nothing, because it is offscreen. As your app changes from state to state, you must adjust its behavior accordingly.

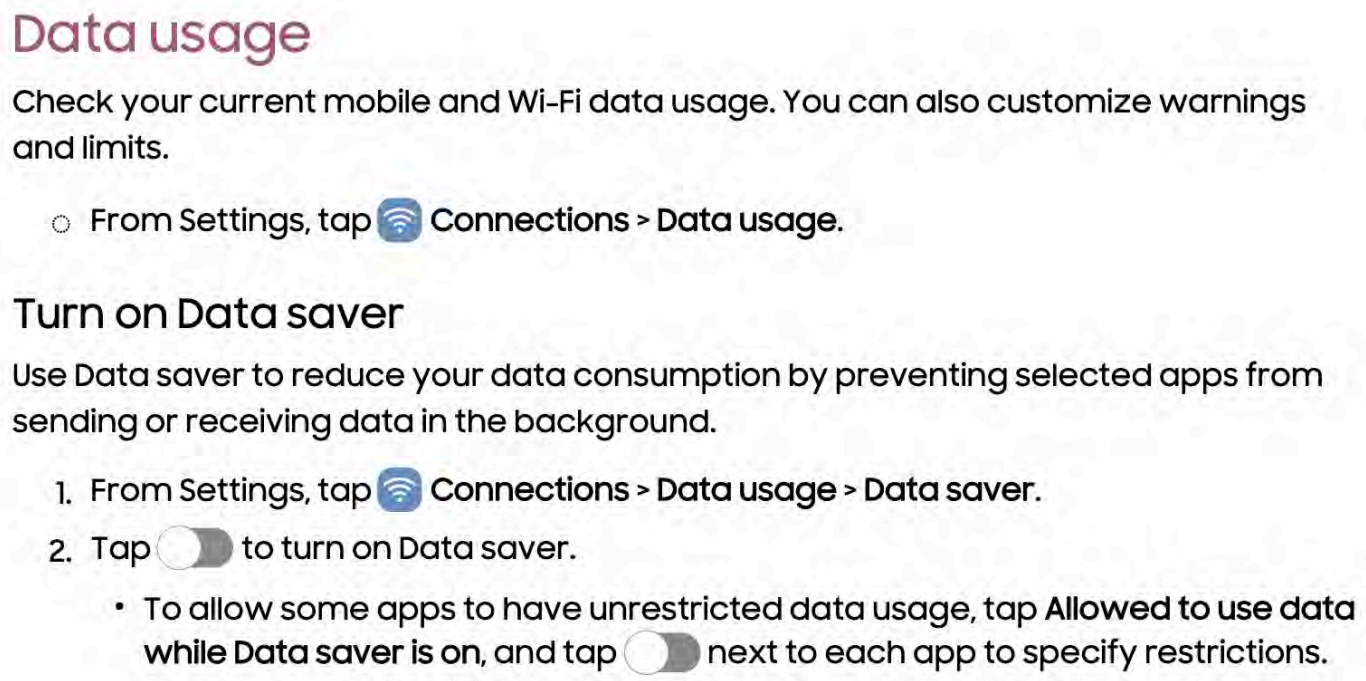

Launch Screen UI
App UI
Unattached
Foreground Inactive
Foreground Active
Suspended
Background
Foreground Inactive

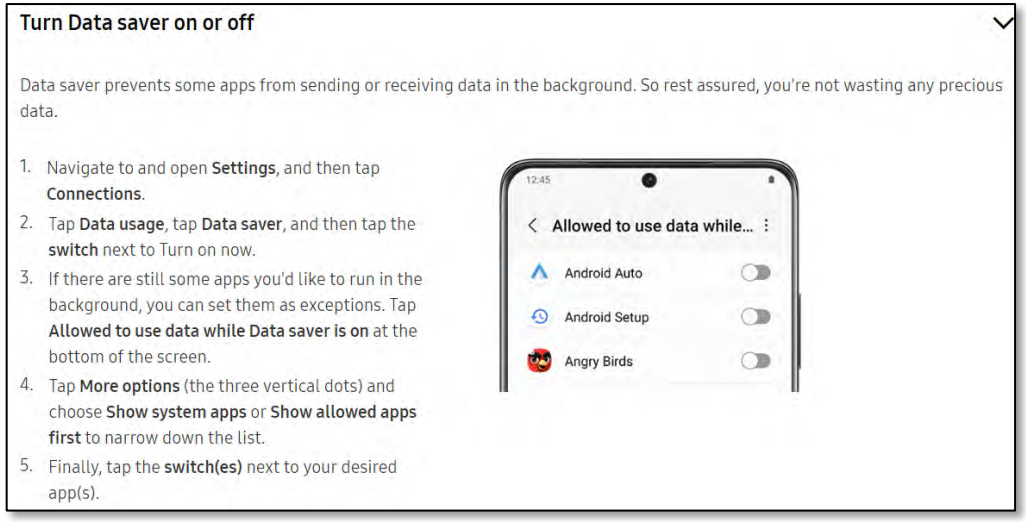
;

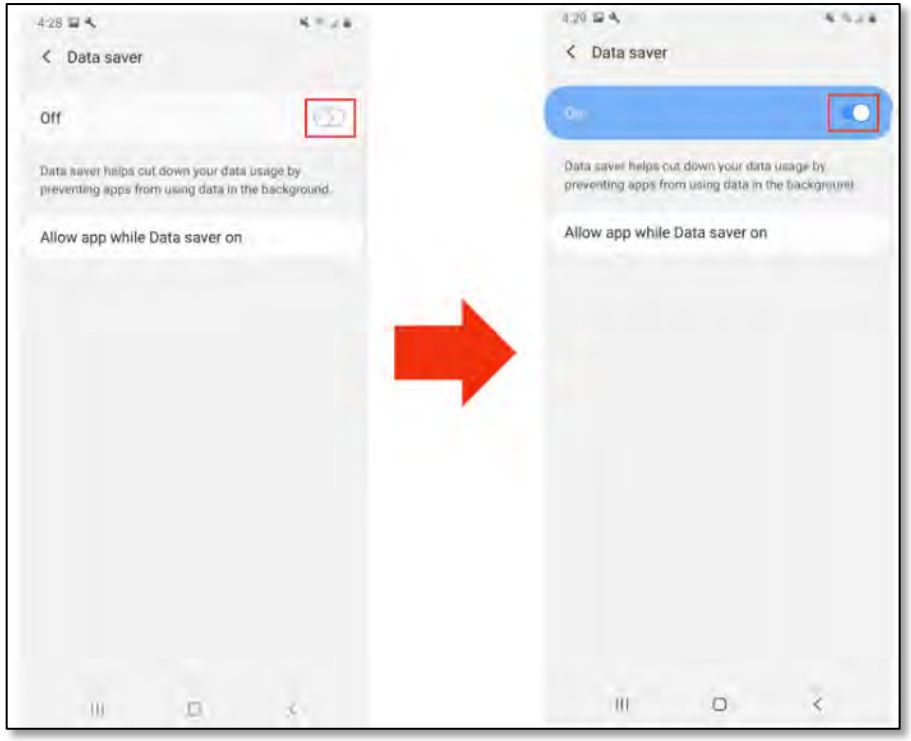
Claim	Public Documentation
	 **Overview** The current state of your app determines what it can and can't do at any time. For example, a foreground app has the user's attention, so it has priority over system resources, including the CPU. By contrast, a background app must do as little work as possible, and preferably nothing, because it's offscreen. As your app changes from state to state, you must adjust its behavior accordingly. When your app's state changes, UIKit notifies you by calling methods of the appropriate delegate object: • In iOS 13 and later, use `UISceneDelegate` objects to respond to life-cycle events in a scene-based app. • In iOS 12 and earlier, use the `UIApplicationDelegate` object to respond to life-cycle events. Note If you enable scene support in your app, iOS always uses your scene delegates in iOS 13 and later. In iOS 12 and earlier, the system uses your app delegate. https://developer.apple.com/documentation/uikit/uibackgroundtaskidentifier:

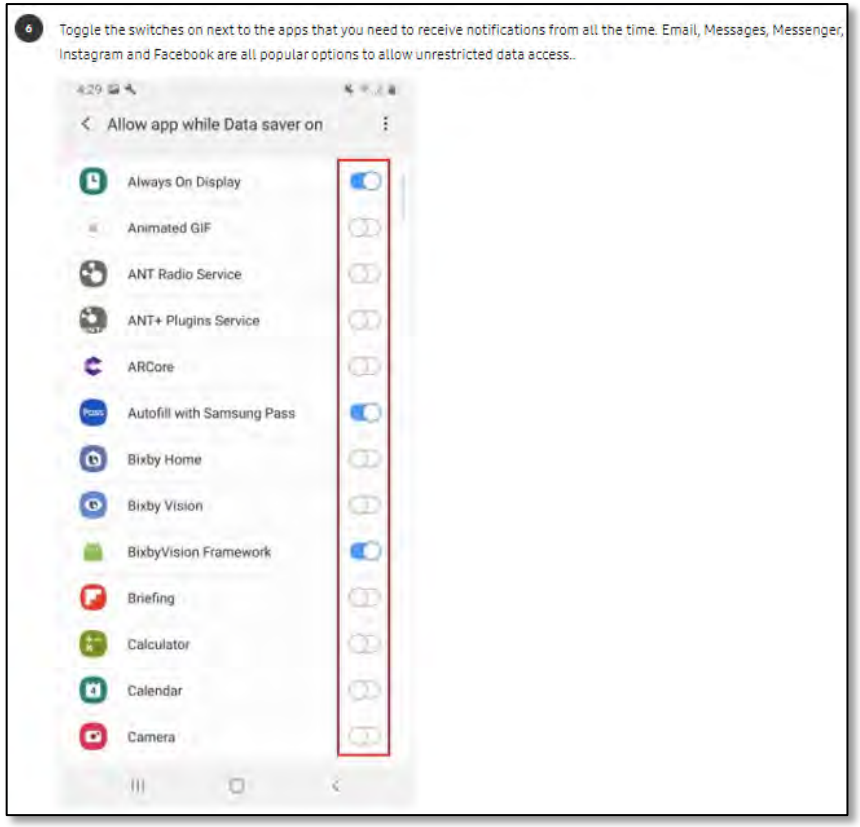
Claim	Public Documentation
	 https://developer.apple.com/documentation/uikit/app_and_environment/scenes:

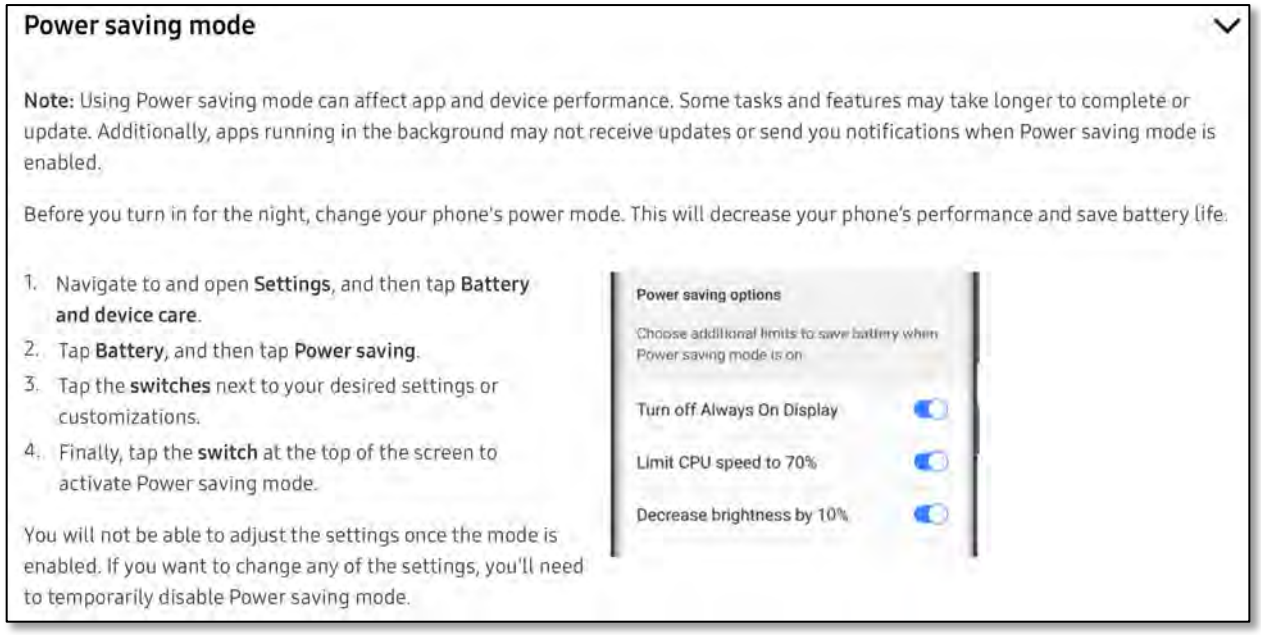
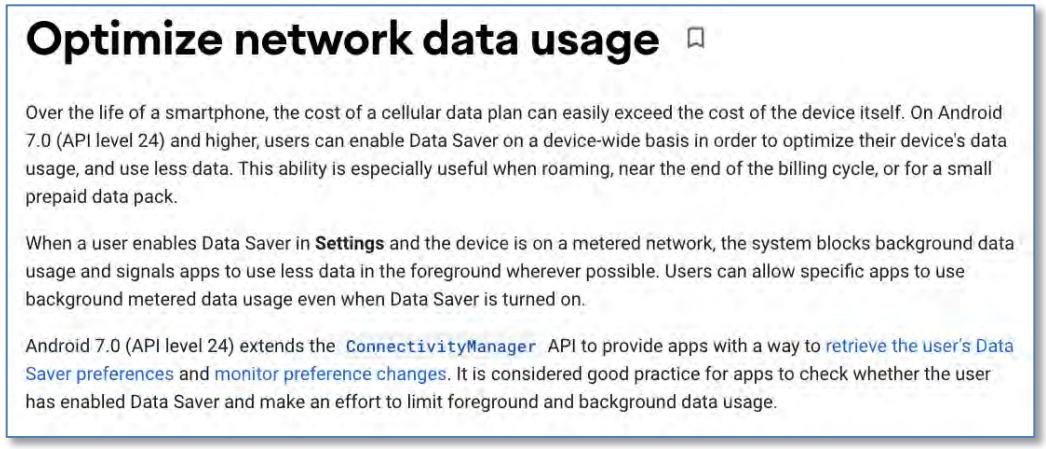
Claim	Public Documentation
	 **Overview** UIKit manages each instance of your app's UI using a `UIWindowScene` object. A *scene* contains the windows and view controllers for presenting one instance of your UI. Each scene also has a corresponding `UIWindowSceneDelegate` object, which you use to coordinate interactions between UIKit and your app. Scenes run concurrently with each other, sharing the same memory and app process space. As a result, a single app may have multiple scenes and scene delegate objects active at the same time. ; https://developer.apple.com/documentation/bundleresources/information_property_list/bgtaskschedulerpermittedidentifiers.
9[a] The non-transitory computer-readable storage medium recited in claim 1, wherein the service usage activity results from cooperation between the first software component and at least one other software component, application, process, function, activity, or service, and wherein identify a service usage activity of the wireless end-user device comprises:	The Accused Instrumentalities comprise the "non-transitory computer-readable storage medium recited in claim 1, wherein the service usage activity results from cooperation between the first software component and at least one other software component, application, process, function, activity, or service." *See*, for example, the disclosures identified for claims 1-6, 8. As a further example, the Accused Instrumentalities comprise multiple software components, applications, processes, functions, activities, or services that result in service usage activities, such as the Settings App co-operating with Data Saver, Power Saver, Doze Mode, App Standby, Adaptive Battery, or JobScheduler and/or one or more applications on a device resulting in service usage activities. *See, e.g.*, https://www.t-mobile.com/support/public-files/attachments/samsung/samsung-galaxy-s21-fe-5g/Samsung%20Galaxy%20S21%20FE%205G_English%20User%20Guide_FINAL2.pdf:

Claim	Public Documentation
	 ;https://www.samsung.com/us/support/answer/ANS00079018/:

Claim	Public Documentation
	 ; https://www.samsung.com/ae/support/mobile-devices/android-pie-what-is-the-data-saver-feature/:

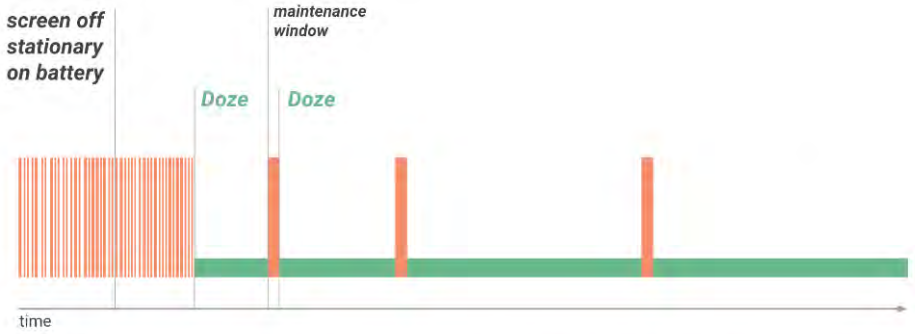
Claim	Public Documentation
	

Claim	Public Documentation
	 ; https://www.samsung.com/us/support/answer/ANS00078987/:

Claim	Public Documentation
	 ; https://developer.android.com/training/basics/network-ops/data-saver: 

Claim	Public Documentation

	Check data saver preferences
	On Android 7.0 (API level 24) and higher, apps can use the `ConnectivityManager` API to determine what data usage restrictions are being applied. The `getRestrictBackgroundStatus()` method returns one of the following values:
	`RESTRICT_BACKGROUND_STATUS_DISABLED`
	Data Saver is disabled.
	`RESTRICT_BACKGROUND_STATUS_ENABLED`
	The user has enabled Data Saver for this app. Apps should make an effort to limit data usage in the foreground and gracefully handle restrictions to background data usage.
	`RESTRICT_BACKGROUND_STATUS_WHITELISTED`
	The user has enabled Data Saver but the app is allowed to bypass it. Apps should still make an effort to limit foreground and background data usage.
	Limit data usage whenever the device is connected to a metered network, even if Data Saver is disabled or the app is allowed to bypass it. The following sample code uses `ConnectivityManager.isActiveNetworkMetered()` and `ConnectivityManager.getRestrictBackgroundStatus()` to determine how much data the app should use:
	
	; https://developer.android.com/training/monitoring-device-state/doze-standby:
	Optimize for Doze and App Standby
	Starting from Android 6.0 (API level 23), Android introduces two power-saving features that extend battery life for users by managing how apps behave when a device is not connected to a power source. *Doze* reduces battery consumption by deferring background CPU and network activity for apps when the device is unused for long periods of time. *App Standby* defers background network activity for apps with which the user has not recently interacted.
	While the device is in Doze, apps' access to certain battery-intensive resources is deferred until maintenance windows. The specific restrictions are listed in Power Management Restrictions.
	Doze and App Standby manage the behavior of all apps running on Android 6.0 or higher, regardless whether they are specifically targeting API level 23. To ensure the best experience for users, test your app in Doze and App Standby modes and make any necessary adjustments to your code. The sections below provide details.

Claim	Public Documentation
	Understanding Doze If a user leaves a device unplugged and stationary for a period of time, with the screen off, the device enters Doze mode. In Doze mode, the system attempts to conserve battery by restricting apps' access to network and CPU-intensive services. It also prevents apps from accessing the network and defers their jobs, syncs, and standard alarms. Periodically, the system exits Doze for a brief time to let apps complete their deferred activities. During this *maintenance window*, the system runs all pending syncs, jobs, and alarms, and lets apps access the network.  **Figure 1.** Doze provides a recurring maintenance window for apps to use the network and handle pending activities. At the conclusion of each maintenance window, the system again enters Doze, suspending network access and deferring jobs, syncs, and alarms. Over time, the system schedules maintenance windows less and less frequently, helping to reduce battery consumption in cases of longer-term inactivity when the device is not connected to a charger. As soon as the user wakes the device by moving it, turning on the screen, or connecting a charger, the system exits Doze and all apps return to normal activity. The Doze restriction on network access is also likely to affect your app, especially if the app relies on real-time messages such as tickles or notifications. If your app requires a persistent connection to the network to receive messages, you should use Firebase Cloud Messaging (FCM) if possible. ; https://developer.android.com/topic/performance/appstandby:

App Standby Buckets

Android 9 (API level 28) and higher support **App Standby Buckets**. App Standby Buckets help the system prioritize apps' requests for resources based on how recently and how frequently the apps are used. Based on app usage patterns, each app is placed in one of five priority **buckets**. The system limits the device resources available to each app based on which bucket the app is in.

Priority buckets

The system dynamically assigns each app to a priority bucket, reassigning the apps as needed. The system may rely on a preloaded app that uses machine learning to determine how likely each app is to be used, and assigns apps to the appropriate buckets. If the system app is not present on a device, the system defaults to sorting apps based on how recently they were used. More active apps are assigned to buckets that give the apps higher priority, making more system resources available to the app. In particular, the bucket determines how frequently the app's jobs run, and how often the app can trigger alarms. These restrictions apply only while the device is on battery power; the system does not impose these restrictions on apps while the device is charging.

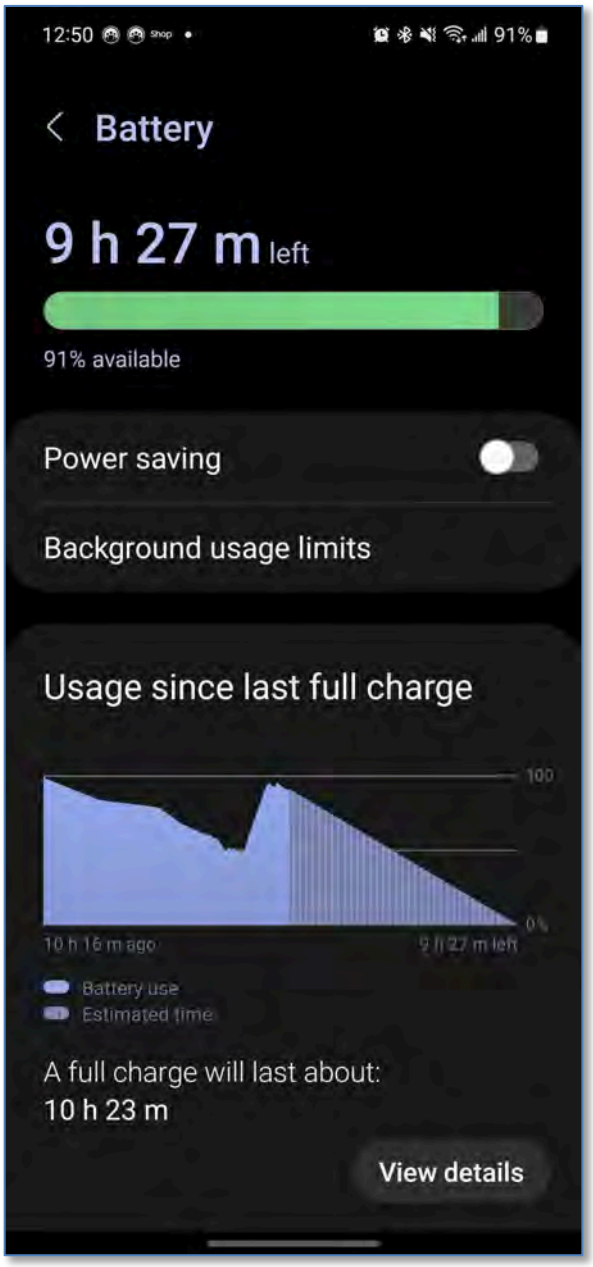
Note: Every manufacturer can set their own criteria for how non-active apps are assigned to buckets. You should not try to influence which bucket your app is assigned to. Instead, focus on making sure your app behaves well in whatever bucket it might be in. Your app can find out what bucket it's currently in by calling `UsageStatsManager.getAppStandbyBucket()`.

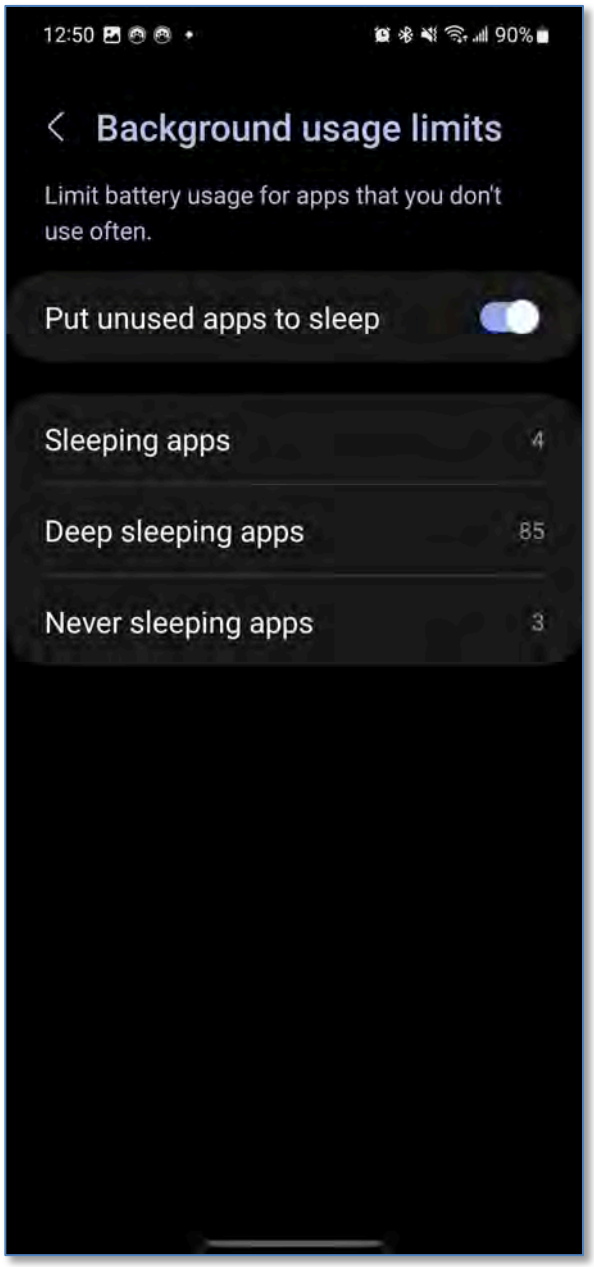
The buckets are:

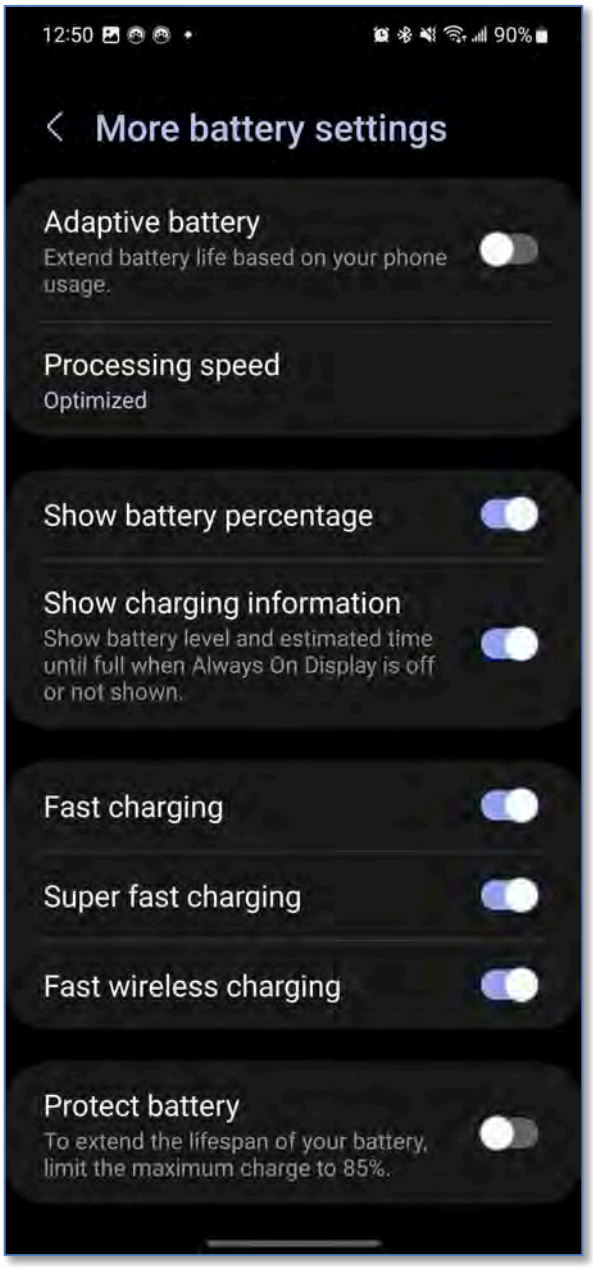
1. Active: App is currently being used or was very recently used.
2. Working set: App is in regular use.
3. Frequent: App is often used, but not every day.
4. Rare: App is not frequently used.
5. Restricted: App consumes a great deal of system resources, or may exhibit undesirable behavior.

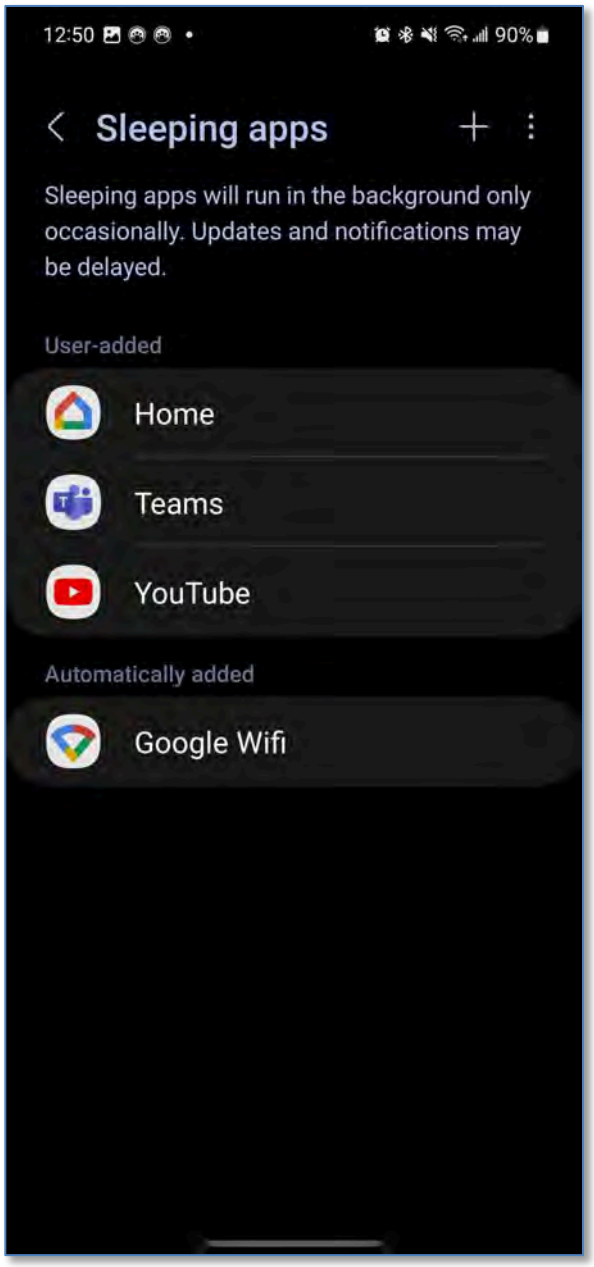
In addition, there's a special **never** bucket for apps that have been installed but have never been run. The system imposes severe restrictions on these apps.

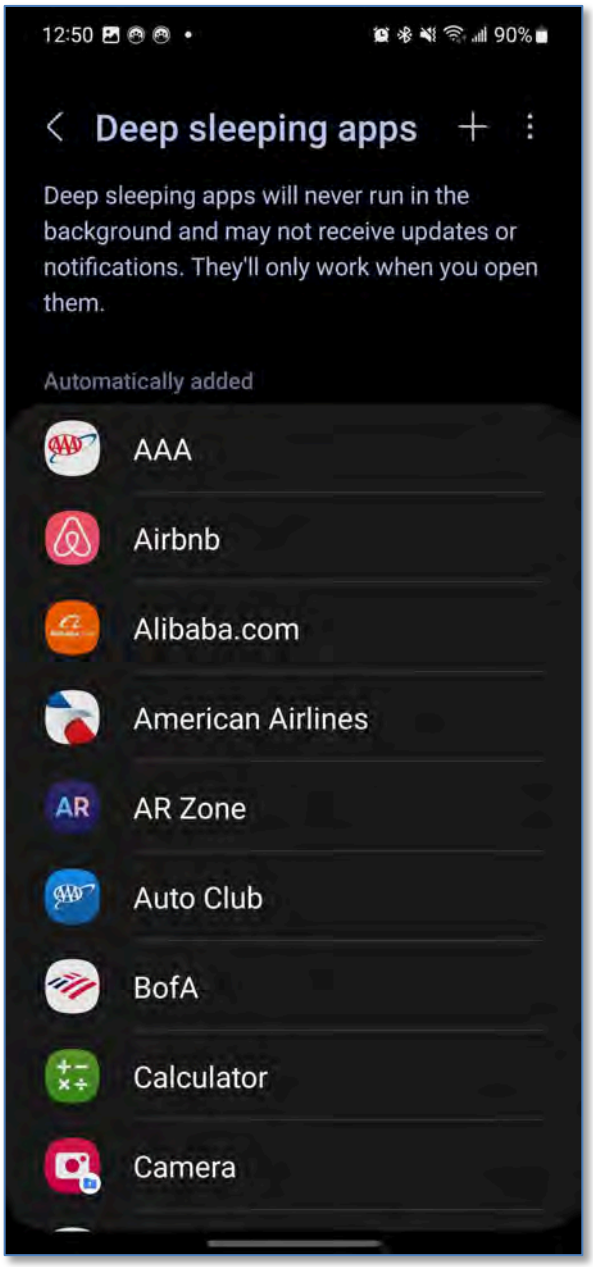
Claim	Public Documentation
	; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler; https://developer.android.com/guide/background/persistent; https://developer.android.com/guide/components/services; *see also* the exemplary screenshots below:

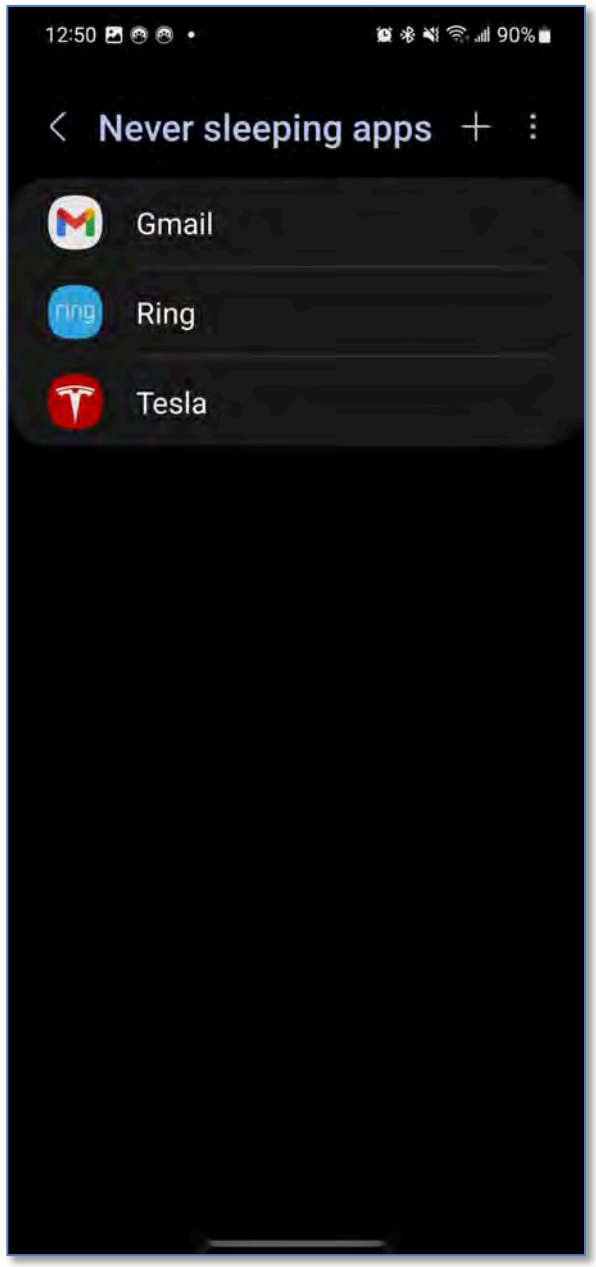

12:50
91%
Battery
9 h 27 m left
91% available
Power saving
Background usage limits
Usage since last full charge
100
0%
10 h 16 m ago
9 h 27 m left
Battery use
Estimated time
A full charge will last about:
10 h 23 m
View details


12:50
90%
Background usage limits
Limit battery usage for apps that you don't use often.
Put unused apps to sleep
Sleeping apps 4
Deep sleeping apps 85
Never sleeping apps 3


12:50
90%
More battery settings
Adaptive battery
Extend battery life based on your phone usage.
Processing speed
Optimized
Show battery percentage
Show charging information
Show battery level and estimated time until full when Always On Display is off or not shown.
Fast charging
Super fast charging
Fast wireless charging
Protect battery
To extend the lifespan of your battery, limit the maximum charge to 85%.


12:50
90%
Sleeping apps
Sleeping apps will run in the background only occasionally. Updates and notifications may be delayed.
User-added
Home
Teams
YouTube
Automatically added
Google Wifi


12:50
90%
Deep sleeping apps
Deep sleeping apps will never run in the background and may not receive updates or notifications. They'll only work when you open them.
Automatically added
AAA
Airbnb
Alibaba.com
American Airlines
AR Zone
Auto Club
BofA
Calculator
Camera


12:50
90%
Never sleeping apps
Gmail
Ring
Tesla

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	As a further example, the Accused Instrumentalities comprise multiple software components, applications, processes, functions, activities, or services that result in service usage activities, such as the Settings App co-operating with Background App Refresh or Low Power Mode and/or one or more applications on a device resulting in service usage activities. *See, e.g.,* https://support.apple.com/en-us/HT202070:

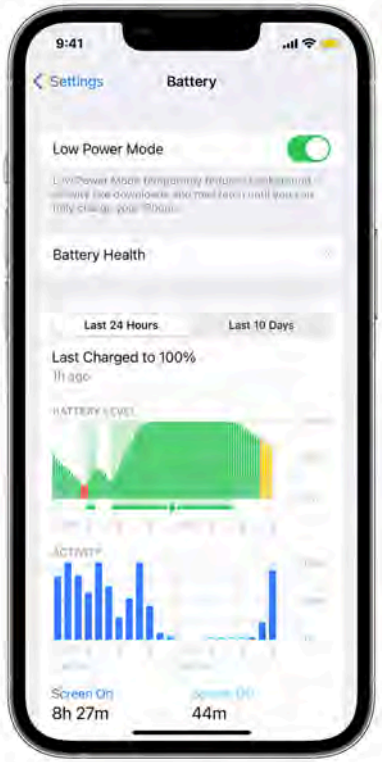
Claim	Public Documentation
	 ; https://support.apple.com/en-us/HT205234:

Use Low Power Mode to save battery life on your iPhone or iPad

Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.



Low Power Mode reduces or affects these features:

- 5G (except for video streaming) on iPhone 12 and iPhone 13 models[1]
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display[2]
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.

1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

Claim	Public Documentation
	See also, e.g., https://www.t-mobile.com/cell-phone-plans; https://www.t-mobile.com/cell-phone-plans/affordable-data-plans; https://www.t-mobile.com/business?INTNAV=tNav%3ABusiness; https://prepaid.t-mobile.com; https://www.t-mobile.com/cell-phone-plans/international-roaming-plans; https://www.t-mobile.com/support/coverage/domestic-roaming-data; https://www.t-mobile.com/customers/unlimited-roaming-sms-data; https://www.t-mobile.com/apps/t-mobile-app; https://www.t-mobile.com/apps/t-mobile-family-mode;
9[b] identify a data flow to or from the at least one other software component, application, process, function, activity, or service; and	The Accused Instrumentalities further "identify a data flow to or from the at least one other software component, application, process, function, activity, or service." *See*, for example, the disclosures identified for claims 1-6, 8, and 9[a].
9[c] associate the data flow with the first software component.	The Accused Instrumentalities further "associate the data flow with the first software component." *See*, for example, the disclosures identified for claims 1-6, 8, and 9[a]-[b].
10. The non-transitory computer-readable storage medium recited in claim 9, wherein the first software component comprises at least a portion of an application, and wherein the at least one other software component, application, process, function, activity, or service performs a proxy function.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 9, wherein the first software component comprises at least a portion of an application, and wherein the at least one other software component, application, process, function, activity, or service performs a proxy function." *See*, for example, the disclosures identified for claims 1-6, and 8-9.
11. The non-transitory computer-readable storage medium recited in claim 9, wherein the at least one other software component, application, process, function, activity,	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 9, wherein the at least one other software component, application, process, function, activity, or service performs a proxy function." *See*, for example, the disclosures identified for claims 1-6, and 8-9.

Claim	Public Documentation
or service performs a proxy function.	
12. The non-transitory computer-readable storage medium recited in claim 9, wherein the at least one other software component, application, process, function, activity, or service comprises a media service manager, an e-mail service manager, a domain name service (DNS) function, a software download service manager, a media download manager, a data download service manager, a media library function, a simple mail transfer protocol (SMTP) proxy, an Internet message access protocol (IMAP) proxy, a post office protocol (POP) proxy, a hypertext transfer protocol (HTTP) proxy, an instant messaging (IM) proxy, a virtual private network (VPN) service manager, or a secure socket layer (SSL) proxy.	The Accused Instrumentalities comprise "nonnon-transitory computer-readable storage medium recited in claim 9, wherein the at least one other software component, application, process, function, activity, or service comprises a media service manager, an e-mail service manager, a domain name service (DNS) function, a software download service manager, a media download manager, a data download service manager, a media library function, a simple mail transfer protocol (SMTP) proxy, an Internet message access protocol (IMAP) proxy, a post office protocol (POP) proxy, a hypertext transfer protocol (HTTP) proxy, an instant messaging (IM) proxy, a virtual private network (VPN) service manager, or a secure socket layer (SSL) proxy." *See*, for example, the disclosures identified for claims 1-6 and 8-9, as well as the following exemplary citations: https://developer.android.com/reference/java/net/URLConnection; https://developer.android.com/training/articles/security-ssl; https://developer.android.com/reference/android/net/DnsResolver; https://developer.android.com/guide/topics/media; https://developer.android.com/media; https://developer.android.com/guide/topics/media/platform/mediaplayer; https://developer.apple.com/documentation/networkextension/dns_settings; https://developer.apple.com/documentation/avfoundation/avplayer; https://developer.apple.com/documentation/avfoundation/media_playback/configuring_your_app_for_media_playback; https://developer.apple.com/documentation/devicemanagement/mail; https://developer.apple.com/documentation/security/secure_transport/using_the_secure_socket_layer_for_network_communication; https://developer.apple.com/documentation/networkextension/personal_vpn; https://developer.apple.com/documentation/foundation/nsproxy; https://developer.apple.com/documentation/messages.
13[a]. The non-transitory computer-readable storage medium recited in claim 1, wherein identify a service usage activity of the wireless end-user device comprises:	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein identify a service usage activity of the wireless end-user device comprises." *See*, for example, the disclosures identified for claims 1-6 and 8-9.

Claim	Public Documentation
13[b] monitor an application proxy service flow; and	The Accused Instrumentalities further "monitor an application proxy service flow." *See*, for example, the disclosures identified for claims 1-6 and 8-9.
13[c] classify the application proxy service flow as being initiated by or belonging to the first software component.	The Accused Instrumentalities further "classify the application proxy service flow as being initiated by or belonging to the first software component." *See*, for example, the disclosures identified for claims 1-6 and 8-9.
14[a]. The non-transitory computer-readable storage medium recited in claim 1, wherein identify a service usage activity of the wireless end-user device comprises:	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein identify a service usage activity of the wireless end-user device comprises." *See*, for example, the disclosures identified for claims 1-6 and 8-9.
14[b] associate an identifier identifying the first software component with a request to a proxy service;	The Accused Instrumentalities further "associate an identifier identifying the first software component with a request to a proxy service." *See*, for example, the disclosures identified for claims 1-6 and 8-9.
14[c] associate the request to the proxy service with a traffic flow, the traffic flow comprising the service usage activity; and	The Accused Instrumentalities further "associate the request to the proxy service with a traffic flow, the traffic flow comprising the service usage activity." *See*, for example, the disclosures identified for claims 1-6 and 8-9.
14[d] associate the traffic flow with the identifier.	The Accused Instrumentalities further "associate the traffic flow with the identifier." *See*, for example, the disclosures identified for claims 1-6 and 8-9.
15. The non-transitory computer-readable storage medium recited in claim 14, wherein the identifier comprises a name, a fingerprint,	The Accused Instrumentalities further "non-transitory computer-readable storage medium recited in claim 14, wherein the identifier comprises a name, a fingerprint, an identification tag, a process number, or a credential." *See*, for example, the disclosures identified for claims 1-6 and 8-9.

Claim	Public Documentation
an identification tag, a process number, or a credential.	
16[a] The non-transitory computer-readable storage medium recited in claim 1, wherein the service usage activity results from cooperation between the first software component and a proxy function, and wherein identify a service usage activity of the wireless end-user device comprises:	The Accused Instrumentalities comprises "non-transitory computer-readable storage medium recited in claim 1, wherein the service usage activity results from cooperation between the first software component and a proxy function, and wherein identify a service usage activity of the wireless end-user device comprises." *See*, for example, the disclosures identified for claims 1-6, 8-9, and 14.
16[b] identify a data flow to or from the proxy function; and	The Accused Instrumentalities further "identify a data flow to or from the proxy function." *See*, for example, the disclosures identified for claims 1-6, 8-9, and 14.
16[c] associate the data flow with the first software component.	The Accused Instrumentalities further "associate the data flow with the first software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, and 14.
17. The non-transitory computer-readable storage medium recited in claim 1, wherein identify a service usage activity of the wireless end-user device comprises identify the service usage activity based on a stream, a flow, a destination, a port, a packet inspection, or a combination of these.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein identify a service usage activity of the wireless end-user device comprises identify the service usage activity based on a stream, a flow, a destination, a port, a packet inspection, or a combination of these." *See*, for example, the disclosures identified for claims 1-6, 8-9, and 14.
18. The non-transitory computer-readable storage medium recited	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein identify a service usage activity of the wireless end-user device comprises determine an identifier

Claim	Public Documentation
in claim 1, wherein identify a service usage activity of the wireless end-user device comprises determine an identifier associated with the first software component, a number associated with the first software component, a name associated with the first software component, or a signature associated with the first software component.	associated with the first software component, a number associated with the first software component, a name associated with the first software component, or a signature associated with the first software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, and 14.
19. The non-transitory computer-readable storage medium recited in claim 1, wherein the first software component comprises at least a portion of an application on the wireless end-user device.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the first software component comprises at least a portion of an application on the wireless end-user device." *See*, for example, the disclosures identified for claims 1-6, 8-9, and 14.
20. The non-transitory computer-readable storage medium recited in claim 1, wherein the first software component comprises an operating system component, function, or service.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the first software component comprises an operating system component, function, or service." *See*, for example, the disclosures identified for claims 1-6, 8-9, and 14.
21. The non-transitory computer-readable storage medium recited in claim 1, wherein the first software component comprises a software function, utility, process, or tool.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the first software component comprises a software function, utility, process, or tool." *See*, for example, the disclosures identified for claims 1-6, 8-9, and 14.

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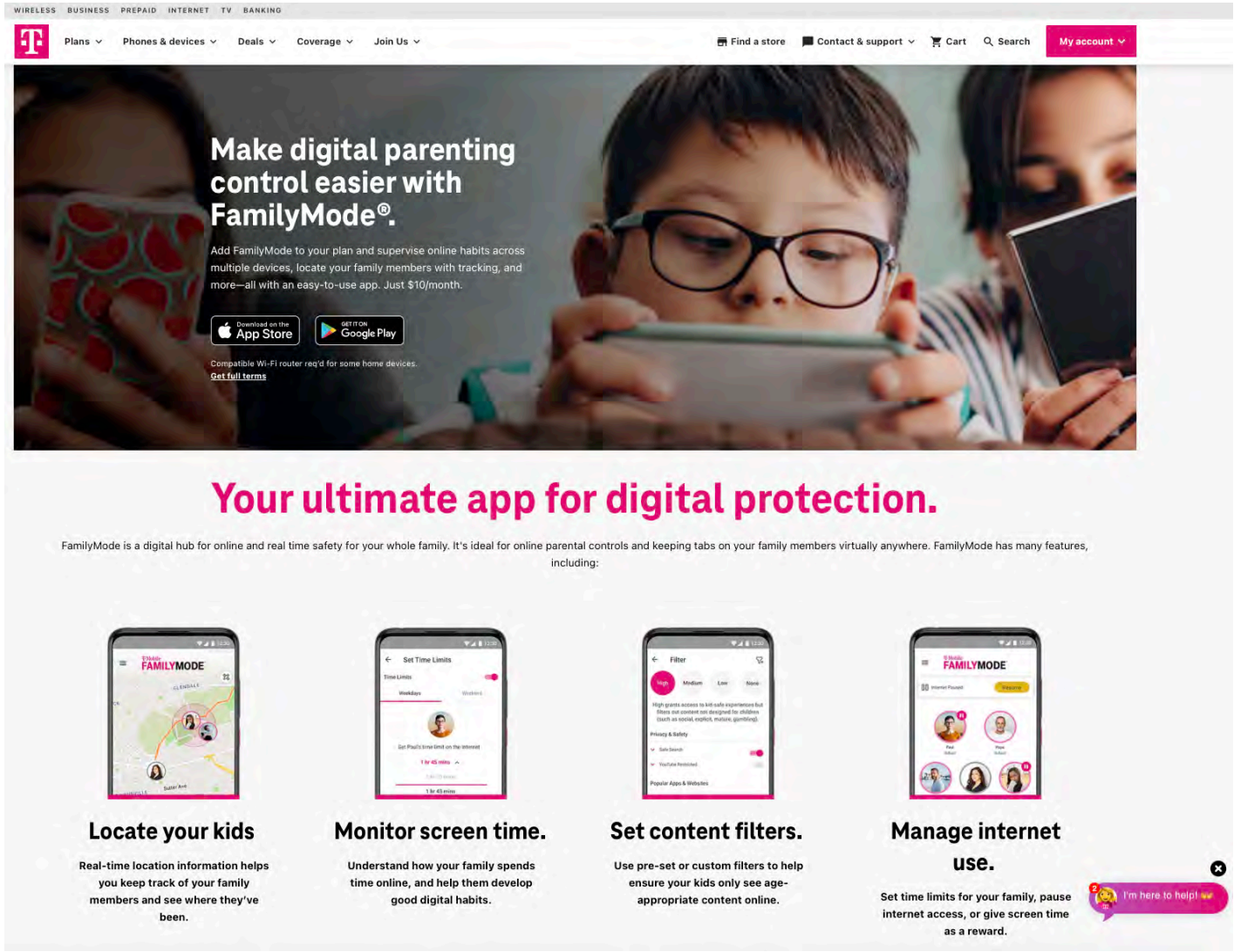
22. The non-transitory computer-readable storage medium recited in claim 1, wherein the first software component comprises a plurality of applications, processes, functions, activities, or services.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the first software component comprises a plurality of applications, processes, functions, activities, or services." *See*, for example, the disclosures identified for claims 1-6, 8-9, and 14.
23. The non-transitory computer-readable storage medium recited in claim 1, wherein the first software component comprises a Java archive (JAR) file, an application that uses an operating system (OS) function, an application that uses a proxy service function, or an OS process function that supports an application or OS function.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the first software component comprises a Java archive (JAR) file, an application that uses an operating system (OS) function, an application that uses a proxy service function, or an OS process function that supports an application or OS function." *See*, for example, the disclosures identified for claims 1-6, 8-9, and 14.
24. The non-transitory computer-readable storage medium recited in claim 1, wherein the network element is communicatively coupled to the wireless end-user device over the wireless network.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the network element is communicatively coupled to the wireless end-user device over the wireless network." *See*, for example, the disclosures identified for claims 1-6, 8-9, and 14. As a further example, the Accused Instrumentalities communicate with network elements. *See, e.g., See also, e.g.,* https://www.t-mobile.com/cell-phone-plans; https://www.t-mobile.com/cell-phone-plans/affordable-data-plans; https://www.t-mobile.com/business?INTNAV=tNav%3ABusiness; https://prepaid.t-mobile.com; https://www.t-mobile.com/cell-phone-plans/international-roaming-plans; https://www.t-mobile.com/support/coverage/domestic-roaming-data; https://www.t-mobile.com/customers/unlimited-roaming-sms-data; https://www.t-mobile.com/apps/t-mobile-app; https://www.t-mobile.com/apps/t-mobile-family-mode; https://www.t-mobile.com/support/devices/not-sold-by-t-mobile/byod-t-mobile-data-and-apn-settings; https://www.t-mobile.com/support/tutorials/device/apple/iphone-x/topic/connections-amp-network/apn-and-data-settings.

Claim	Public Documentation
25. The non-transitory computer-readable storage medium recited in claim 1, wherein the policy is based on an amount of time, a time of day, a day of a week, a schedule, a network busy state, a network performance state, a network quality-of-service state, a priority of the service usage activity, or a combination of these.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the policy is based on an amount of time, a time of day, a day of a week, a schedule, a network busy state, a network performance state, a network quality-of-service state, a priority of the service usage activity, or a combination of these." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, and 24. As a further example, the Accused Instrumentalities comprise policies based on network states. *See, e.g.,* https://developer.android.com/training/basics/network-ops/reading-network-state; https://developer.android.com/reference/android/net/NetworkCapabilities; https://developer.android.com/about/versions/pie/android-9.0. As a further example, the Accused Instrumentalities comprise policies based on based on an amount of time, a time of day, a day of a week, a schedule, or a combination of one of these or other policies comprised in the exemplary citations found in claims 1-6, 8-9, 14, and 24. *See, e.g.,* https://www.t-mobile.com/apps/t-mobile-app; https://www.t-mobile.com/apps/t-mobile-family-mode:

Claim	Public Documentation
	 ; https://www.t-mobile.com/support/devices/not-sold-by-t-mobile/byod-t-mobile-data-and-apn-settings; https://www.t-mobile.com/support/tutorials/device/apple/iphone-x/topic/connections-amp-network/apn-and-data-settings.

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26. The non-transitory computer-readable storage medium recited in claim 1, wherein the policy is based on a background service class, a background service state, or a combination of these.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the policy is based on a background service class, a background service state, or a combination of these." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
27. The non-transitory computer-readable storage medium recited in claim 1, wherein the policy is based on at least an aspect of a service plan.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the policy is based on at least an aspect of a service plan." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
28. The non-transitory computer-readable storage medium recited in claim 1, wherein the policy is based on a behavior of the first software component, a behavior of the service usage activity, a messaging layer behavior, a random back-off, a power state of the wireless end-user device, a usage state of the wireless end-user device, or a combination of these.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the policy is based on a behavior of the first software component, a behavior of the service usage activity, a messaging layer behavior, a random back-off, a power state of the wireless end-user device, a usage state of the wireless end-user device, or a combination of these." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
29. The non-transitory computer-readable storage medium recited in claim 1, wherein the policy is based on a user interaction with the first software component, a user interaction with the service	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the policy is based on a user interaction with the first software component, a user interaction with the service usage activity, a user interaction with the wireless end-user device, a user interface priority of the service usage activity, or a combination of these." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.

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usage activity, a user interaction with the wireless end-user device, a user interface priority of the service usage activity, or a combination of these.	
30. The non-transitory computer-readable storage medium recited in claim 1, wherein the wireless end-user device is part of a device group, and wherein the policy is associated with the device group.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the wireless end-user device is part of a device group, and wherein the policy is associated with the device group." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
31. The non-transitory computer-readable storage medium recited in claim 1, wherein the policy is based on a type of the wireless network.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the policy is based on a type of the wireless network." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
32. The non-transitory computer-readable storage medium recited in claim 31, wherein the type of the wireless network is cellular, 2G, 3G, 4G, home, roaming, wireless fidelity (WiFi), or a combination of these.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 31, wherein the type of the wireless network is cellular, 2G, 3G, 4G, home, roaming, wireless fidelity (WiFi), or a combination of these." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
33. The non-transitory computer-readable storage medium recited in claim 1, wherein the policy is based on a roaming condition of the wireless end-user device, a	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the policy is based on a roaming condition of the wireless end-user device, a cost associated with communicating over the wireless network, or a combination of these." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.

Claim	Public Documentation
cost associated with communicating over the wireless network, or a combination of these.	
34. The non-transitory computer-readable storage medium recited in claim 1, wherein controlling the service usage activity comprises preventing the first software component from launching, executing, or running.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein controlling the service usage activity comprises preventing the first software component from launching, executing, or running." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
35. The non-transitory computer-readable storage medium recited in claim 1, wherein the at least an aspect of the policy is based on the user input obtained through the user interface of the wireless end-user device, and wherein the user input identifies the first software component or the service usage activity.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the at least an aspect of the policy is based on the user input obtained through the user interface of the wireless end-user device, and wherein the user input identifies the first software component or the service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
36. The non-transitory computer-readable storage medium recited in claim 1, wherein the at least an aspect of the policy is based on the user input obtained through the user interface of the wireless end-user device, and wherein the user input identifies a network parameter or a network type.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the at least an aspect of the policy is based on the user input obtained through the user interface of the wireless end-user device, and wherein the user input identifies a network parameter or a network type." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.

Claim	Public Documentation
37. The non-transitory computer-readable storage medium recited in claim 1, wherein the policy is based on a usage limit or a threshold.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the policy is based on a usage limit or a threshold." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25. *See also, e.g.,* https://www.t-mobile.com/support/plans-features/data-speeds.
38. The non-transitory computer-readable storage medium recited in claim 1, wherein the policy is based on a limit, wherein the limit is based on the user input obtained through the user interface of the wireless end-user device, a user preference, an indication of a threshold, a total traffic, a type of traffic, a destination, a port, a frequency of access, an access behavior, or a combination of these.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the policy is based on a limit, wherein the limit is based on the user input obtained through the user interface of the wireless end-user device, a user preference, an indication of a threshold, a total traffic, a type of traffic, a destination, a port, a frequency of access, an access behavior, or a combination of these." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 37.
39. The non-transitory computer-readable storage medium recited in claim 1, wherein the policy is based on a type of the service usage activity, a priority of the service usage activity, a duration of the service usage activity, a characteristic of the wireless network, a quality-of-service (QoS) rule associated with the service usage activity, or a combination of these.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the policy is based on a type of the service usage activity, a priority of the service usage activity, a duration of the service usage activity, a characteristic of the wireless network, a quality-of-service (QoS) rule associated with the service usage activity, or a combination of these." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 37.

Claim	Public Documentation
40. The non-transitory computer-readable storage medium recited in claim 1, wherein the policy comprises one or more filters, wherein the one or more filters provide filtering based on: a characteristic of the wireless network, a service plan applicable to the wireless end-user device, a characteristic of the first software component, a time of day, a network busy state, or a combination of these.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the policy comprises one or more filters, wherein the one or more filters provide filtering based on: a characteristic of the wireless network, a service plan applicable to the wireless end-user device, a characteristic of the first software component, a time of day, a network busy state, or a combination of these." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 37.
41. The non-transitory computer-readable storage medium recited in claim 1, wherein the wireless network is a first wireless network, and wherein the service usage activity is a first service usage activity, and wherein the policy assists the one or more processors to control the first service usage activity when the wireless end-user device is connected to the first wireless network and refrain from controlling a second service usage activity when the wireless end-user device is connected to a second wireless network, the second service usage activity being associated with the first software component.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the wireless network is a first wireless network, and wherein the service usage activity is a first service usage activity, and wherein the policy assists the one or more processors to control the first service usage activity when the wireless end-user device is connected to the first wireless network and refrain from controlling a second service usage activity when the wireless end-user device is connected to a second wireless network, the second service usage activity being associated with the first software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 37.

Claim	Public Documentation
42. The non-transitory computer-readable storage medium recited in claim 41, wherein control the first service usage activity comprises prevent, restrict, or block the first service usage activity.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 41, wherein control the first service usage activity comprises prevent, restrict, or block the first service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 37, and 41.
43. The non-transitory computer-readable storage medium recited in claim 1, wherein the second wireless network is a wireless fidelity (WiFi) network or a home network.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the second wireless network is a wireless fidelity (WiFi) network or a home network." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
44. The non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether a user is interacting with or has interacted with the first software component.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether a user is interacting with or has interacted with the first software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
45. The non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether the first software component is in a user interface foreground.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether the first software component is in a user interface foreground." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.

Claim	Public Documentation
46. The non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether the service usage activity is a software update.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether the service usage activity is a software update." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
47. The non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether the first software component is or has been classified as being in a background state or the service usage activity is or has been classified as a background service.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether the first software component is or has been classified as being in a background state or the service usage activity is or has been classified as a background service." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
48. The non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether the service usage activity is identified by a list specifying one or more background activities.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether the service usage activity is identified by a list specifying one or more background activities." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.

Claim	Public Documentation
49. The non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether the service usage activity is a foreground activity.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether the service usage activity is a foreground activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
50. The non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether the first software component is a foreground component.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether the first software component is a foreground component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
51[a] The non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises:	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
51[b] determine a classification of the service usage activity, and	The Accused Instrumentalities further "determine a classification of the service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
51[c] based on the classification of the service usage activity, determine whether the service usage	The Accused Instrumentalities "based on the classification of the service usage activity, determine whether the service usage activity comprises the background activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.

Claim	Public Documentation
activity comprises the background activity.	
52. The non-transitory computer-readable storage medium recited in claim 51, wherein the classification of the service usage activity is based on: whether the first software component requires access to the wireless network, whether the one or more prospective or successful communications over the wireless network comprise an update to the first software component, whether the first software component requires information about the wireless network, whether the first software component requires location information, whether the one or more prospective or successful communications over the wireless network comprise an operating system software update, whether the one or more prospective or successful communications over the wireless network comprise a security software update, whether the one or more prospective or successful communications over the wireless network comprise a communication associated with a network-based back-up, whether the one or more	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 51, wherein the classification of the service usage activity is based on: whether the first software component requires access to the wireless network, whether the one or more prospective or successful communications over the wireless network comprise an update to the first software component, whether the first software component requires information about the wireless network, whether the first software component requires location information, whether the one or more prospective or successful communications over the wireless network comprise an operating system software update, whether the one or more prospective or successful communications over the wireless network comprise a security software update, whether the one or more prospective or successful communications over the wireless network comprise a communication associated with a network-based back-up, whether the one or more prospective or successful communications over the wireless network comprise a communication associated with an e-mail download, whether the one or more prospective or successful communications over the wireless network comprise communications associated with a cloud synchronization service, or a combination of these." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 51.

Claim	Public Documentation
prospective or successful communications over the wireless network comprise a communication associated with an e-mail download, whether the one or more prospective or successful communications over the wireless network comprise communications associated with a cloud synchronization service, or a combination of these.	
53. The non-transitory computer-readable storage medium recited in claim 51, wherein the user input obtained through the user interface of the wireless end-user device is a first user input, and wherein determine a classification of the service usage activity is based on a characteristic of the first software component, a content type associated with the service usage activity, a characteristic of the wireless network, a service plan, a user preference, the first user input, a second user input, the information from the network element, or a combination of these.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 51, wherein the user input obtained through the user interface of the wireless end-user device is a first user input, and wherein determine a classification of the service usage activity is based on a characteristic of the first software component, a content type associated with the service usage activity, a characteristic of the wireless network, a service plan, a user preference, the first user input, a second user input, the information from the network element, or a combination of these." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 51.
54. The non-transitory computer-readable storage medium recited in claim 1, wherein determine	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 51, wherein the user input obtained through the user interface of the wireless end-user device is a first user input, and wherein determine a classification of the service usage activity is based on a characteristic of the

Claim	Public Documentation
whether the service usage activity comprises a background activity is based on a user interaction with the wireless end-user device.	first software component, a content type associated with the service usage activity, a characteristic of the wireless network, a service plan, a user preference, the first user input, a second user input, the information from the network element, or a combination of these." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
55. The non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether a value comprising a measure of the service usage activity satisfies a condition relative to a threshold.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether a value comprising a measure of the service usage activity satisfies a condition relative to a threshold." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
56. The non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether the first software component is a foreground component or an unclassified component.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether the first software component is a foreground component or an unclassified component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
57. The non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether the first software component is in a	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether the first software component is in a foreground of user interaction or determine whether the first software component is in a background of user interaction." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.

Claim	Public Documentation
foreground of user interaction or determine whether the first software component is in a background of user interaction.	
58. The non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether content associated with the service usage activity is in a foreground of a user interface of the wireless end-user device.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether content associated with the service usage activity is in a foreground of a user interface of the wireless end-user device." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
59. The non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether the first software component is active.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein determine whether the service usage activity comprises a background activity comprises determine whether the first software component is active." *S See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
60. The non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in allowing, restricting, delaying, throttling, or preventing the service usage activity.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in allowing, restricting, delaying, throttling, or preventing the service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.

Claim	Public Documentation
61. The non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in: blocking access to the wireless network, restricting access to the wireless network, delaying access to the wireless network, or aggregating and holding the service usage activity.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in: blocking access to the wireless network, restricting access to the wireless network, delaying access to the wireless network, or aggregating and holding the service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
62. The non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in queuing, time-windowing, suspending, quarantining, killing, or removing the service usage activity.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in queuing, time-windowing, suspending, quarantining, killing, or removing the service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
63. The non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in preventing an update associated with the first software component.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in preventing an update associated with the first software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
64. The non-transitory computer-readable storage medium recited in claim 1, wherein the one or more prospective or successful communications over the wireless	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the one or more prospective or successful communications over the wireless network comprise one or more Internet protocol (IP) address requests, and wherein apply the policy comprises at least assist in withholding, delaying, time-windowing, reducing in frequency, or aggregating at least a portion of the service usage activity."

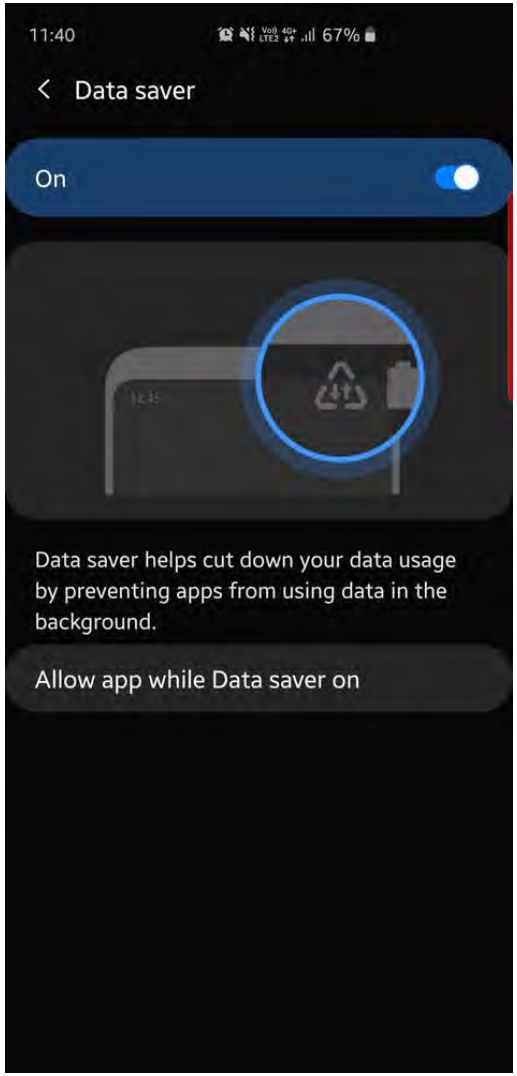
Claim	Public Documentation
network comprise one or more Internet protocol (IP) address requests, and wherein apply the policy comprises at least assist in withholding, delaying, time-windowing, reducing in frequency, or aggregating at least a portion of the service usage activity.	*See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
65. The non-transitory computer-readable storage medium recited in claim 1, wherein the information from the network element is first information, and wherein apply the policy comprises provide second information to the first software component.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the information from the network element is first information, and wherein apply the policy comprises provide second information to the first software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
66. The non-transitory computer-readable storage medium recited in claim 65, wherein provide second information to the first software component comprises provide the second information through an application programming interface.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 65, wherein provide second information to the first software component comprises provide the second information through an application programming interface." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 65.
67[a] The non-transitory computer-readable storage medium recited in claim 65, wherein, when executed by the one or more processors of the wireless end-user	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 65, wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 65.

Claim	Public Documentation
device, the machine-executable instructions further cause the one or more processors to:	
67[b] provide third information to a second software component on the wireless end-user device, the third information being different from the second information.	The Accused Instrumentalities further "provide third information to a second software component on the wireless end-user device, the third information being different from the second information." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 65.
68. The non-transitory computer-readable storage medium recited in claim 67, wherein provide third information to a second software component on the wireless end-user device comprises provide the third information through an application programming interface.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 67, wherein provide third information to a second software component on the wireless end-user device comprises provide the third information through an application programming interface." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 65, and 67.
69. The non-transitory computer-readable storage medium recited in claim 67, wherein the third information enables the second software component to communicate over the wireless network.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 67, wherein the third information enables the second software component to communicate over the wireless network." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 65, and 67.
70. The non-transitory computer-readable storage medium recited in claim 65, wherein the wireless network is a first wireless network, and wherein the second information comprises a network	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 65, wherein the wireless network is a first wireless network, and wherein the second information comprises a network access condition of the first wireless network, a network busy state associated with the first wireless network, a network availability state associated with the first wireless network, a network busy state associated with a second wireless network, a network availability state associated with the second wireless network, or information about the policy."

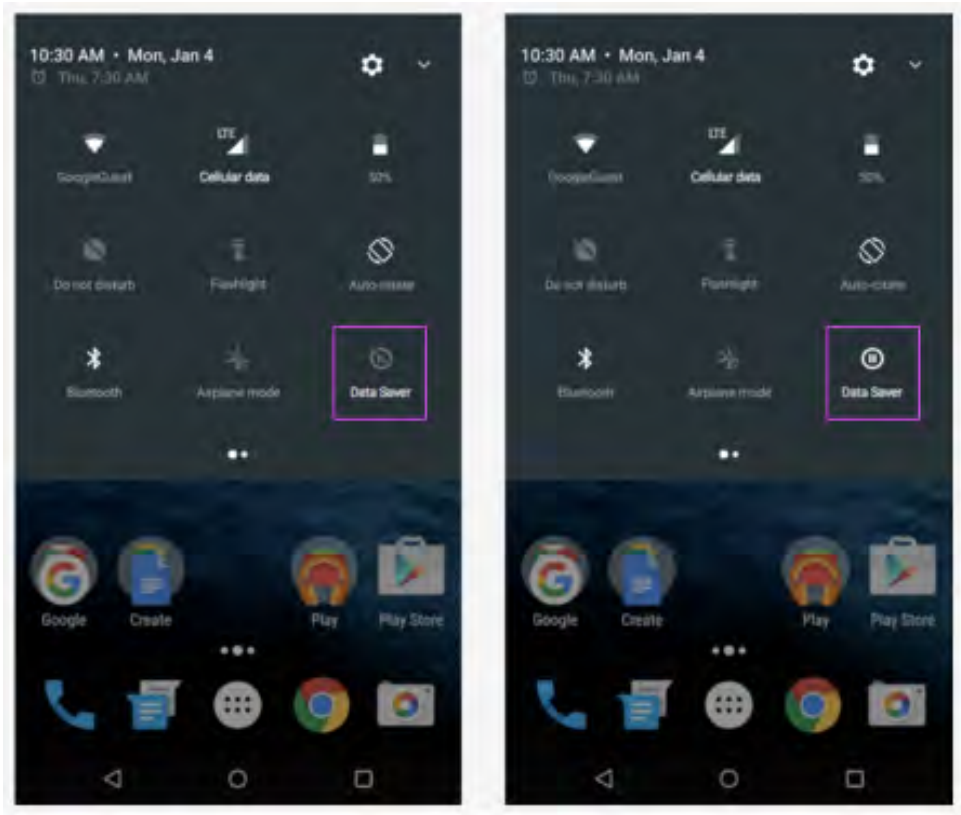
Claim	Public Documentation
access condition of the first wireless network, a network busy state associated with the first wireless network, a network availability state associated with the first wireless network, a network busy state associated with a second wireless network, a network availability state associated with the second wireless network, or information about the policy.	*See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 65, and 67.
71. The non-transitory computer-readable storage medium recited in claim 65, wherein the second information comprises a setting for assisting the first software component in restricting, allowing, blocking, throttling, deferring, time-scheduling, or queuing the service usage activity.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 65, wherein the second information comprises a setting for assisting the first software component in restricting, allowing, blocking, throttling, deferring, time-scheduling, or queuing the service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 65.
72. The non-transitory computer-readable storage medium recited in claim 71, wherein the setting is based on a characteristic of the wireless network, a network busy state associated with the wireless network, a time, a service plan associated with the wireless end-user device, a classification of the service usage activity, or a combination of these.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 71, wherein the setting is based on a characteristic of the wireless network, a network busy state associated with the wireless network, a time, a service plan associated with the wireless end-user device, a classification of the service usage activity, or a combination of these." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 65, and 71.

Claim	Public Documentation
73. The non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises inform the first software component whether the first software component is allowed to access the wireless network.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises inform the first software component whether the first software component is allowed to access the wireless network." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
74. The non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises inform the first software component whether the wireless network is available.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises inform the first software component whether the wireless network is available." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
75. The non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises inform the first software component of a traffic control to be implemented or applied by the first software component.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises inform the first software component of a traffic control to be implemented or applied by the first software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
76. The non-transitory computer-readable storage medium recited in claim 1, wherein the information from the network element is first information, and wherein apply the policy comprises obtain second information from the first software component.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the information from the network element is first information, and wherein apply the policy comprises obtain second information from the first software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.

Claim	Public Documentation
77. The non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in intercepting, controlling, blocking, modifying, removing, or replacing a notification associated with the first software component or the service usage activity, the notification for presentation through a user interface of the wireless end-user device.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in intercepting, controlling, blocking, modifying, removing, or replacing a notification associated with the first software component or the service usage activity, the notification for presentation through a user interface of the wireless end-user device." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25. As a further example, the Accused Instrumentalities cause a notification to be presented to a user. *See, e.g.*, exemplary screenshots:

Claim	Public Documentation
	

Data usage
Usage
300 MB cellular data
Mar 1 - Mar 30
Data Saver
Off
Cellular
Cellular data
Use data while roaming
Cellular data usage
Data saver
Off
Unrestricted data access

Claim	Public Documentation
	

12:37
63%
Wed, 26 Jan
Device control
Media output
Android System
Data warning
You've used 2.00 GB of data
Ultra data saving mode
Fast charging (43 m until full)
Notification settings
Clear
Dialog

Claim	Public Documentation

	; https://source.android.com/docs/core/data/data-saver; https://developer.android.com/training/basics/network-ops/data-saver:
	
	Check data saver preferences
	
	On Android 7.0 (API level 24) and higher, apps can use the `ConnectivityManager` API to determine what data usage restrictions are being applied. The `getRestrictBackgroundStatus()` method returns one of the following values:
	
	`RESTRICT_BACKGROUND_STATUS_DISABLED`
	
	Data Saver is disabled.
	
	`RESTRICT_BACKGROUND_STATUS_ENABLED`
	
	The user has enabled Data Saver for this app. Apps should make an effort to limit data usage in the foreground and gracefully handle restrictions to background data usage.
	
	`RESTRICT_BACKGROUND_STATUS_WHITELISTED`
	
	The user has enabled Data Saver but the app is allowed to bypass it. Apps should still make an effort to limit foreground and background data usage.
	
	; https://support.apple.com/en-us/HT205234:

Use Low Power Mode to save battery life on your iPhone or iPad

Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

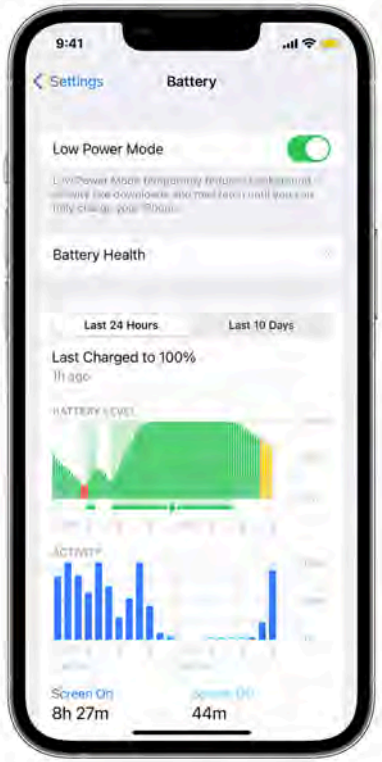
To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.

Low Power Mode reduces or affects these features:

- 5G (except for video streaming) on iPhone 12 and iPhone 13 models[1]
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display[2]
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

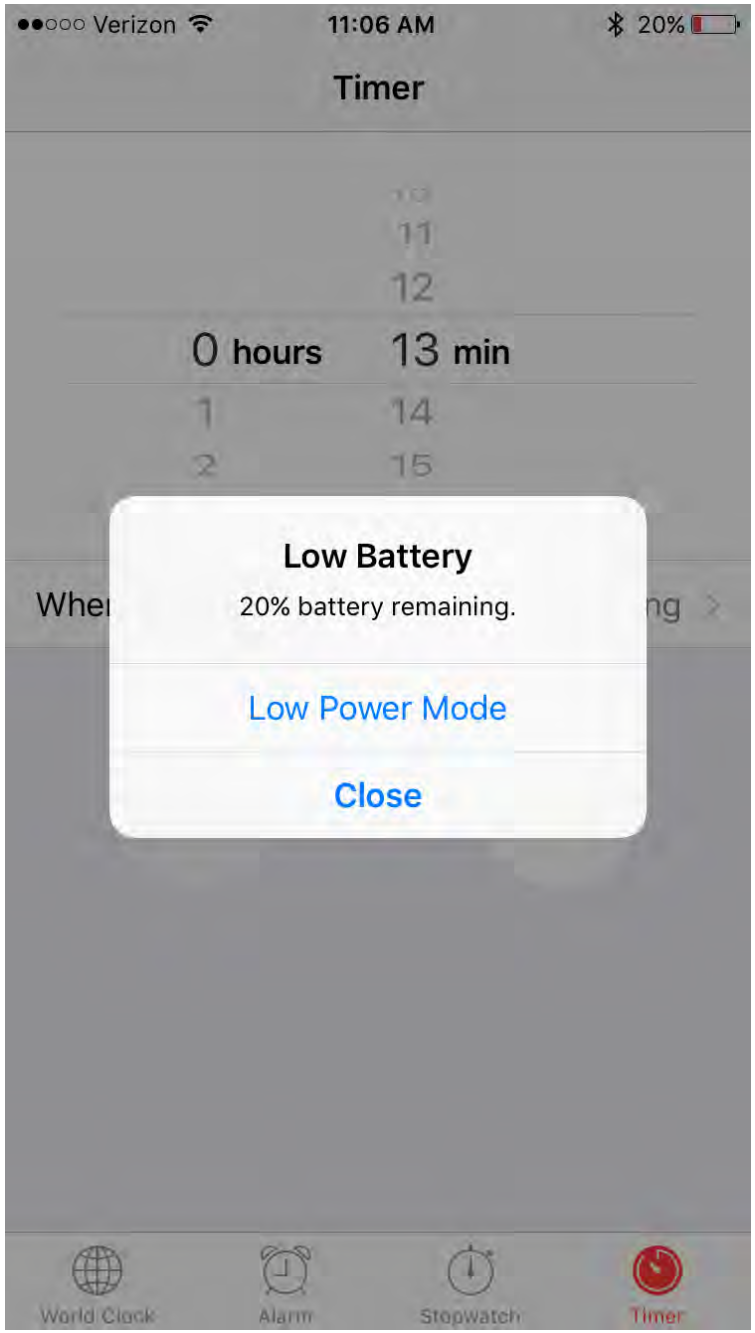
When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.

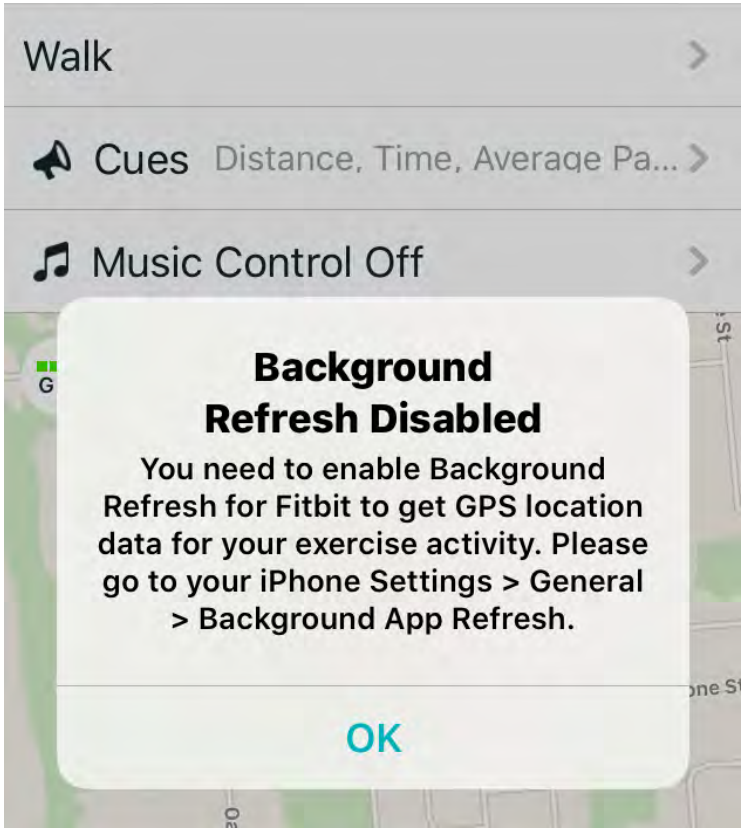


1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

Claim	Public Documentation
	; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus: Instance Property **backgroundRefreshStatus** Indicates whether the app can refresh content when running in the background. iOS 7.0+ iPadOS 7.0+ Mac Catalyst 13.1+ tvOS 11.0+ visionOS 1.0+ Beta `var backgroundRefreshStatus: UIBackgroundRefreshStatus { get }` **Discussion** You can use this property to determine whether Background App Refresh—an app's ability to open in the background to perform refresh tasks—is enabled, and warn the user if it is not. Don't warn the user if the value of this property is set to `UIBackgroundRefreshStatus.restricted`. A restricted user, such as one who is managed under parental controls, can't enable Background App Refresh. Background App Refresh is disabled automatically when a device is operating in low-power mode. When this happens, the time available for performing background tasks is reduced to save power. https://support.apple.com/en-us/HT213336; *see also* exemplary screenshots:


Verizon
11:06 AM
20%
Timer
11
12
0 hours
13 min
1
14
2
15
Low Battery
20% battery remaining.
Low Power Mode
Close
World Clock
Alarm
Stopwatch
Timer

Claim	Public Documentation
	
78. The non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in intercepting, controlling, blocking, modifying, removing, or replacing a notification for presentation through a user interface of the wireless end-user device.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in intercepting, controlling, blocking, modifying, removing, or replacing a notification for presentation through a user interface of the wireless end-user device." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 78.

Claim	Public Documentation
79. The non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in intercepting a stack application programming interface (API) level or application messaging layer request.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the information from the network element is first information, and wherein apply the policy comprises obtain second information from the first software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 78.
80. The non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in killing or suspending the service usage activity or the first software component.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in killing or suspending the service usage activity or the first software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, and 14.
81. The non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in changing or setting a priority of the service usage activity.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in changing or setting a priority of the service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
82. The non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in emulating a network application programming interface (API) message.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in emulating a network application programming interface (API) message." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.

Claim	Public Documentation
83. The non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in intercepting, modifying, blocking, removing, injecting, swapping, or replacing an application interface message.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises at least assist in intercepting, modifying, blocking, removing, injecting, swapping, or replacing an application interface message." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 78.
84[a] The non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises:	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
84[b] at least assist in preventing initiation of the service usage activity by the first software component; and	The Accused Instrumentalities further comprise "at least assist in preventing initiation of the service usage activity by the first software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
84[c] send a message to the first software component.	The Accused Instrumentalities further comprise "send a message to the first software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
85. The non-transitory computer-readable storage medium recited in claim 84, wherein initiation of the service usage activity by the first software component comprises opening of a connection, opening of a socket, initiating transmission, initiating a data flow, or initiating a data stream.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 84, wherein initiation of the service usage activity by the first software component comprises opening of a connection, opening of a socket, initiating transmission, initiating a data flow, or initiating a data stream." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.

Claim	Public Documentation
86. The non-transitory computer-readable storage medium recited in claim 84, wherein the message comprises a reset message, an indication that the service usage activity is not allowed, or an indication that the wireless network is not available.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 84, wherein the message comprises a reset message, an indication that the service usage activity is not allowed, or an indication that the wireless network is not available." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
87[a] The non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises:	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
87[b] identify a socket to be opened for the service usage activity; and	The Accused Instrumentalities further "identify a socket to be opened for the service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
87[c] based on a condition, block the service usage activity or terminate the socket.	The Accused Instrumentalities "based on a condition, block the service usage activity or terminate the socket." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
88. The non-transitory computer-readable storage medium recited in claim 1, wherein controlling the service usage activity comprises: blocking a network access event or attempt associated with the first software component, modulating a number of access events or attempts associated with the first software component, aggregating	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein controlling the service usage activity comprises: blocking a network access event or attempt associated with the first software component, modulating a number of access events or attempts associated with the first software component, aggregating a plurality of access events or attempts associated with the first software component, or time-windowing the number of access events or attempts associated with the first software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.

Claim	Public Documentation
a plurality of access events or attempts associated with the first software component, or time-windowing the number of access events or attempts associated with the first software component.	
89[a] The non-transitory computer-readable storage medium recited in claim 1, wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to:	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
89[b] if it is determined that the service usage activity is not the background activity, refrain from applying the policy.	The Accused Instrumentalities further comprise "if it is determined that the service usage activity is not the background activity, refrain from applying the policy." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
90[a] The non-transitory computer-readable storage medium recited in claim 1, wherein the policy is a first policy, and wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to:	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the policy is a first policy, and wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.

Claim	Public Documentation
90[b] if it is determined that the service usage activity is not the background activity, apply a second policy.	The Accused Instrumentalities further comprise "if it is determined that the service usage activity is not the background activity, apply a second policy." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, and 25.
91. The non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises cause a notification to be presented through a user interface of the wireless end-user device.	The Accused Instrumentalities further comprise "non-transitory computer-readable storage medium recited in claim 1, wherein apply the policy comprises cause a notification to be presented through a user interface of the wireless end-user device." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 78.
92. The non-transitory computer-readable storage medium recited in claim 91, wherein the notification provides information about the policy.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 91, wherein the notification provides information about the policy." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, and 91.
93. The non-transitory computer-readable storage medium recited in claim 91, wherein the notification provides information about an option to set, control, override, or modify the at least an aspect of the policy or a second aspect of the policy.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 91, wherein the notification provides information about an option to set, control, override, or modify the at least an aspect of the policy or a second aspect of the policy." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, and 91.
94. The non-transitory computer-readable storage medium recited in claim 91, wherein, when executed by the one or more processors of the wireless end-user	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 91, wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to obtain an indication of a user response to the notification."

Claim	Public Documentation
device, the machine-executable instructions further cause the one or more processors to obtain an indication of a user response to the notification.	*See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, and 91.
95. The non-transitory computer-readable storage medium recited in claim 91, wherein the notification provides a warning or an alert.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 91, wherein the notification provides a warning or an alert." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, and 91.
96. The non-transitory computer-readable storage medium recited in claim 91, wherein the notification provides information about a service plan limit.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 91, wherein the notification provides information about a service plan limit." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, and 91.
97. The non-transitory computer-readable storage medium recited in claim 91, wherein the first software component is at least a portion of an application, and wherein the one or more prospective or successful communications over the wireless network comprise an attempt to launch, run, or execute the application, and wherein the notification comprises information about the attempt to launch, run, or execute the application.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 91, wherein the first software component is at least a portion of an application, and wherein the one or more prospective or successful communications over the wireless network comprise an attempt to launch, run, or execute the application, and wherein the notification comprises information about the attempt to launch, run, or execute the application." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, and 91.

Claim	Public Documentation
98. The non-transitory computer-readable storage medium recited in claim 91, wherein the one or more prospective or successful communications over the wireless network comprise an attempted or successful launch or execution of the first software component, and wherein the notification comprises information about the attempted or successful launch or execution of the first software component.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 91, wherein the one or more prospective or successful communications over the wireless network comprise an attempted or successful launch or execution of the first software component, and wherein the notification comprises information about the attempted or successful launch or execution of the first software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, and 91.
99. The non-transitory computer-readable storage medium recited in claim 91, wherein the policy is based on a limit, and wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to determine that a data usage associated with the service usage activity is not less than the limit, and wherein cause a notification to be presented through a user interface of the wireless end-user device comprises trigger presentation of the notification based on the determination that the data usage associated with the service usage activity is not less than the limit.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 91, wherein the policy is based on a limit, and wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to determine that a data usage associated with the service usage activity is not less than the limit, and wherein cause a notification to be presented through a user interface of the wireless end-user device comprises trigger presentation of the notification based on the determination that the data usage associated with the service usage activity is not less than the limit." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, and 91.

Claim	Public Documentation
100. The non-transitory computer-readable storage medium recited in claim 91, wherein the one or more prospective or successful communications over the wireless network comprise an attempt to download or load an application, and wherein the notification comprises information about the attempted download or load of the application.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 91, wherein the one or more prospective or successful communications over the wireless network comprise an attempt to download or load an application, and wherein the notification comprises information about the attempted download or load of the application." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, and 91.
101. The non-transitory computer-readable storage medium recited in claim 91, wherein the one or more prospective or successful communications over the wireless network comprise an attempt to initiate usage of a cloud-based service or application, and wherein the notification comprises information about the attempted initiation of usage of the cloud-based service or application.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 91, wherein the one or more prospective or successful communications over the wireless network comprise an attempt to initiate usage of a cloud-based service or application, and wherein the notification comprises information about the attempted initiation of usage of the cloud-based service or application." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, and 91.
102. The non-transitory computer-readable storage medium recited in claim 91, wherein the notification indicates that one or more service usage activities are subject to the policy.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 91, wherein the notification indicates that one or more service usage activities are subject to the policy." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, and 91.

Claim	Public Documentation
103. The non-transitory computer-readable storage medium recited in claim 91, wherein the notification provides information about a second network.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 91, wherein the notification provides information about a second network." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, and 91.
104. The non-transitory computer-readable storage medium recited in claim 91, wherein the notification comprises an offer for a service plan upgrade or downgrade.	The Accused Instrumentalities comprise "-transitory computer-readable storage medium recited in claim 91, wherein the notification comprises an offer for a service plan upgrade or downgrade." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, and 91.
105. The non-transitory computer-readable storage medium recited in claim 91, wherein apply the policy further comprises obtain an indication of a user preference in response to the notification.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 91, wherein apply the policy further comprises obtain an indication of a user preference in response to the notification." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, and 91.
106. The non-transitory computer-readable storage medium recited in claim 105, wherein the indication of the user preference comprises a user directive to associate the policy with a second software component.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 105, wherein the indication of the user preference comprises a user directive to associate the policy with a second software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 91, and 105.
107. The non-transitory computer-readable storage medium recited in claim 105, wherein the indication of the user preference comprises a user directive to allow or block the service usage activity.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 105, wherein the indication of the user preference comprises a user directive to allow or block the service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 91, and 105.

Claim	Public Documentation
108. The non-transitory computer-readable storage medium recited in claim 105, wherein the indication of the user preference identifies a traffic control setting associated with the policy.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 105, wherein the indication of the user preference identifies a traffic control setting associated with the policy." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 91, and 105.
109. The non-transitory computer-readable storage medium recited in claim 105, wherein the indication of the user preference comprises a user directive to allow the service usage activity under a specified condition.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 105, wherein the indication of the user preference comprises a user directive to allow the service usage activity under a specified condition." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 91, and 105.
110. The non-transitory computer-readable storage medium recited in claim 105, wherein the indication of the user preference comprises a user directive to override or modify the policy.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 105, wherein the indication of the user preference comprises a user directive to override or modify the policy." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 91, and 105.
111. The non-transitory computer-readable storage medium recited in claim 91, wherein cause a notification to be presented through a user interface of the wireless end-user device comprises cause the notification to be presented based on occurrence of a trigger.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 91, wherein cause a notification to be presented through a user interface of the wireless end-user device comprises cause the notification to be presented based on occurrence of a trigger." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, and 91.

Claim	Public Documentation
112. The non-transitory computer-readable storage medium recited in claim 111, wherein the trigger is: a measure of the service usage activity satisfies a first condition relative to a threshold, an aspect of the service usage activity satisfies a second condition, a change to the policy, or a message from the network element.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 111, wherein the trigger is: a measure of the service usage activity satisfies a first condition relative to a threshold, an aspect of the service usage activity satisfies a second condition, a change to the policy, or a message from the network element." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 91, and 111.
113. The non-transitory computer-readable storage medium recited in claim 91, wherein the notification enables a user associated with the wireless end-user device to obtain information about at least an aspect of the service usage activity or a service plan associated with the wireless end-user device.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 91, wherein the notification enables a user associated with the wireless end-user device to obtain information about at least an aspect of the service usage activity or a service plan associated with the wireless end-user device." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 78.
114. The non-transitory computer-readable storage medium recited in claim 91, wherein the notification presents a list of service usage activities or software components, the list of service usage activities or software components including the service usage activity or the first software component.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 91, wherein the notification presents a list of service usage activities or software components, the list of service usage activities or software components including the service usage activity or the first software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 78.
115. The non-transitory computer-readable storage medium recited	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 91, wherein the notification presents an option to modify the policy."

Claim	Public Documentation
in claim 91, wherein the notification presents an option to modify the policy.	*See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 78.
116. The non-transitory computer-readable storage medium recited in claim 91, wherein the notification presents an indication of a measure of usage of the wireless network associated with the service usage activity.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 91, wherein the notification presents an indication of a measure of usage of the wireless network associated with the service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 78.
117. The non-transitory computer-readable storage medium recited in claim 91, wherein the notification is provided through an e-mail, a text message, a window, a setting, or a voice message.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 91, wherein the notification is provided through an e-mail, a text message, a window, a setting, or a voice message." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 78.
118[a] The non-transitory computer-readable storage medium recited in claim 1, wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to:	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 78.
118[b] cause a notification to be presented through a user interface of the wireless end-user device.	The Accused Instrumentalities further "cause a notification to be presented through a user interface of the wireless end-user device." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 78.

Claim	Public Documentation
119. The non-transitory computer-readable storage medium recited in claim 118, wherein the notification provides information about the policy.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein the notification provides information about the policy." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 91, and 118.
120. The non-transitory computer-readable storage medium recited in claim 118, wherein the notification provides information about an option to set, control, override, or modify the at least an aspect of the policy or a second aspect of the policy.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein the notification provides information about an option to set, control, override, or modify the at least an aspect of the policy or a second aspect of the policy." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 91, and 118.
121. The non-transitory computer-readable storage medium recited in claim 118, wherein the notification indicates that the service usage activity is the background activity.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein the notification indicates that the service usage activity is the background activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 91, and 118.
122. The non-transitory computer-readable storage medium recited in claim 118, wherein the notification provides information about a second network.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein the notification provides information about a second network." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 91, and 118.
123. The non-transitory computer-readable storage medium recited in claim 118, wherein, when executed by the one or more processors of the wireless end-user	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to obtain an indication of a user preference in response to the notification."

Claim	Public Documentation
device, the machine-executable instructions further cause the one or more processors to obtain an indication of a user preference in response to the notification.	*See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 91, and 118.
124. The non-transitory computer-readable storage medium recited in claim 123, wherein the indication of the user preference comprises a user directive to associate the policy with the first software component.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 123, wherein the indication of the user preference comprises a user directive to associate the policy with the first software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 91, 118, and 123.
125. The non-transitory computer-readable storage medium recited in claim 123, wherein the indication of the user preference comprises a user directive to restrict, allow, or block the service usage activity.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 123, wherein the indication of the user preference comprises a user directive to restrict, allow, or block the service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 91, 118, and 123.
126. The non-transitory computer-readable storage medium recited in claim 123, wherein the indication of the user preference identifies a traffic control setting associated with the policy.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 123, wherein the indication of the user preference identifies a traffic control setting associated with the policy." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, 118, and 123.
127. The non-transitory computer-readable storage medium recited in claim 123, wherein the indica-	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 123, wherein the indication of the user preference comprises a user directive to override or modify the policy." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, 118, and 123.

Claim	Public Documentation
tion of the user preference comprises a user directive to override or modify the policy.	
128. The non-transitory computer-readable storage medium recited in claim 123, wherein the indication of the user preference comprises a user acknowledgment of the notification.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 123, wherein the indication of the user preference comprises a user acknowledgment of the notification." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, 118, and 123.
129. The non-transitory computer-readable storage medium recited in claim 123, wherein the indication of the user preference indicates one or more network types.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 123, wherein the indication of the user preference indicates one or more network types." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, 118, and 123.
130. The non-transitory computer-readable storage medium recited in claim 129, wherein the one or more network types comprise WiFi, 4G, 3G, wireless, wired, or a combination of these.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 129, wherein the one or more network types comprise WiFi, 4G, 3G, wireless, wired, or a combination of these." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, 118, and 123.
131. The non-transitory computer-readable storage medium recited in claim 118, wherein cause a notification to be presented through a user interface of the wireless end-user device comprises cause the notification to be presented based on occurrence of a trigger.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein cause a notification to be presented through a user interface of the wireless end-user device comprises cause the notification to be presented based on occurrence of a trigger." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, and 118.

Claim	Public Documentation
132. The non-transitory computer-readable storage medium recited in claim 131, wherein the trigger is: a measure of the service usage activity satisfies a first condition relative to a threshold, an aspect of the service usage activity satisfies a second condition, a change to the policy, or a message from the network element.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 131, wherein the trigger is: a measure of the service usage activity satisfies a first condition relative to a threshold, an aspect of the service usage activity satisfies a second condition, a change to the policy, or a message from the network element." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, 118, and 131.
133. The non-transitory computer-readable storage medium recited in claim 118, wherein the notification enables a user associated with the wireless end-user device to obtain information about at least an aspect of the service usage activity or a service plan associated with the wireless end-user device.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein the notification enables a user associated with the wireless end-user device to obtain information about at least an aspect of the service usage activity or a service plan associated with the wireless end-user device." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, and 118.
134. The non-transitory computer-readable storage medium recited in claim 118, wherein the notification presents a list of service usage activities or software components, the list of service usage activities or software components including the service usage activity or the first software component.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein the notification presents a list of service usage activities or software components, the list of service usage activities or software components including the service usage activity or the first software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, and 118.
135. The non-transitory computer-readable storage medium recited	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein the notification presents information about a setting associated with the policy."

Claim	Public Documentation
in claim 118, wherein the notification presents information about a setting associated with the policy.	*See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, and 118.
136. The non-transitory computer-readable storage medium recited in claim 118, wherein the notification presents information about the wireless network.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein the notification presents information about the wireless network." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, and 118.
137. The non-transitory computer-readable storage medium recited in claim 118, wherein the notification presents an indication of a measure of usage of the wireless network associated with the service usage activity.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein the notification presents information about the wireless network." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, and 118.
138. The non-transitory computer-readable storage medium recited in claim 118, wherein the notification presents information about a network busy state or a network availability state.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein the notification presents information about a network busy state or a network availability state." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, and 118.
139. The non-transitory computer-readable storage medium recited in claim 118, wherein the notification presents an indication of a measure of usage of the wireless network associated with the first software component.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein the notification presents an indication of a measure of usage of the wireless network associated with the first software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, and 118.

Claim	Public Documentation
140. The non-transitory computer-readable storage medium recited in claim 118, wherein the notification presents information about a statistic associated with the service usage activity.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein the notification presents information about a statistic associated with the service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, and 118.
141. The non-transitory computer-readable storage medium recited in claim 118, wherein the notification comprises a gauge providing service usage information associated with the service usage activity.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein the notification comprises a gauge providing service usage information associated with the service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, and 118.
142. The non-transitory computer-readable storage medium recited in claim 118, wherein the notification comprises a gauge providing service usage information associated with one or more networks, the one or more networks including the wireless network.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein the notification comprises a gauge providing service usage information associated with one or more networks, the one or more networks including the wireless network." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, and 118.
143. The non-transitory computer-readable storage medium recited in claim 118, wherein the notification comprises a gauge providing information associated with a service plan.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein the notification comprises a gauge providing information associated with a service plan." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, and 118.

Claim	Public Documentation
144. The non-transitory computer-readable storage medium recited in claim 118, wherein the notification is provided through an e-mail, a text message, a window, a setting, or a voice message.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein the notification is provided through an e-mail, a text message, a window, a setting, or a voice message." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, and 118.
145. The non-transitory computer-readable storage medium recited in claim 118, wherein the notification comprises a warning or an alert.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein the notification comprises a warning or an alert." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, and 118.
146. The non-transitory computer-readable storage medium recited in claim 118, wherein the information from the network element is first information, and wherein the notification is based on second information from the network element.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein the information from the network element is first information, and wherein the notification is based on second information from the network element." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, and 118.
147. The non-transitory computer-readable storage medium recited in claim 118, wherein the notification comprises information about a cost or a charge associated with the service usage activity.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein the notification comprises information about a cost or a charge associated with the service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, and 118.
148. The non-transitory computer-readable storage medium recited	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 118, wherein the notification comprises information about a service sponsor." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, and 118.

Claim	Public Documentation
in claim 118, wherein the notification comprises information about a service sponsor.	
149[a] The non-transitory computer-readable storage medium recited in claim 1, wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to:	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, and 118.
149[b] detect an attempted use of the first software component; and	The Accused Instrumentalities further "detect an attempted use of the first software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, and 118.
149[c] based on the detected attempted use of the first software component, cause a notification to be presented through a user interface of the wireless end-user device.	The Accused Instrumentalities "based on the detected attempted use of the first software component, cause a notification to be presented through a user interface of the wireless end-user device." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, and 118.
150. The non-transitory computer-readable storage medium recited in claim 149, wherein the notification provides information to enable a user associated with the wireless end-user device to override the policy.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 149, wherein the notification provides information to enable a user associated with the wireless end-user device to override the policy." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, 118, and 149.

Claim	Public Documentation
151. The non-transitory computer-readable storage medium recited in claim 149, wherein the notification provides information about a cost or a charge associated with the service usage activity.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 149, wherein the notification provides information about a cost or a charge associated with the service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, 118, and 149.
152. The non-transitory computer-readable storage medium recited in claim 149, wherein the notification provides information to enable a user associated with the wireless end-user device to change or upgrade a service plan associated with the wireless end-user device.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 149, wherein the notification provides information to enable a user associated with the wireless end-user device to change or upgrade a service plan associated with the wireless end-user device." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, 118, and 149.
153. The non-transitory computer-readable storage medium recited in claim 1, wherein the at least an aspect of a policy is based on the user input obtained through the user interface of the wireless end-user device, and wherein the user input specifies a user preference associated with one or more network types.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the at least an aspect of a policy is based on the user input obtained through the user interface of the wireless end-user device, and wherein the user input specifies a user preference associated with one or more network types." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, 118, and 149.
154. The non-transitory computer-readable storage medium recited in claim 153, wherein the one or more network types comprise wireless fidelity (WiFi), home,	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 153, wherein the one or more network types comprise wireless fidelity (WiFi), home, roaming, 4G, 3G, wireless, wired, or a combination of these." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, 78, 97, 118, and 149.

Claim	Public Documentation
roaming, 4G, 3G, wireless, wired, or a combination of these.	
155. The non-transitory computer-readable storage medium recited in claim 1, wherein the user input obtained through the user interface of the wireless end-user device is a first user input, and wherein the policy is a first policy, and wherein the first user input or a second user input comprises a directive to apply a second policy to a second software component of the plurality of software components on the wireless end-user device.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the user input obtained through the user interface of the wireless end-user device is a first user input, and wherein the policy is a first policy, and wherein the first user input or a second user input comprises a directive to apply a second policy to a second software component of the plurality of software components on the wireless end-user device." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24-25, and 78.
156. The non-transitory computer-readable storage medium recited in claim 1, wherein the user input obtained through the user interface of the wireless end-user device is a first user input, and wherein the first user input or a second user input comprises a directive to refrain from applying the policy to a second software component of the plurality of software components on the wireless end-user device.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the user input obtained through the user interface of the wireless end-user device is a first user input, and wherein the first user input or a second user input comprises a directive to refrain from applying the policy to a second software component of the plurality of software components on the wireless end-user device." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.

Claim	Public Documentation
157. The non-transitory computer-readable storage medium recited in claim 1, wherein the user input obtained through the user interface of the wireless end-user device comprises a directive to apply the policy to a second software component of the plurality of software components on the wireless end-user device.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the user input obtained through the user interface of the wireless end-user device comprises a directive to apply the policy to a second software component of the plurality of software components on the wireless end-user device." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
158. The non-transitory computer-readable storage medium recited in claim 1, wherein the user input obtained through the user interface of the wireless end-user device specifies a user preference associated with the service usage activity or the first software component.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the user input obtained through the user interface of the wireless end-user device specifies a user preference associated with the service usage activity or the first software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
159. The non-transitory computer-readable storage medium recited in claim 158, wherein the user preference comprises a preference to restrict, allow, block, delay, or throttle the service usage activity.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 158, wherein the user preference comprises a preference to restrict, allow, block, delay, or throttle the service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
160[a] The non-transitory computer-readable storage medium recited in claim 1, wherein the service usage activity is a first service usage activity, and wherein	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the service usage activity is a first service usage activity, and wherein the wireless network is a first wireless network, and wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to."

Claim	Public Documentation
the wireless network is a first wireless network, and wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to:	*See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
160[b] identify a second service usage activity of the wireless end-user device, the second service usage activity being associated with the first software component or with a second software component of the plurality of software components on the wireless end-user device, the second service usage activity comprising one or more prospective or successful communications over a second wireless network; and	The Accused Instrumentalities further "identify a second service usage activity of the wireless end-user device, the second service usage activity being associated with the first software component or with a second software component of the plurality of software components on the wireless end-user device, the second service usage activity comprising one or more prospective or successful communications over a second wireless network." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
160[c] refrain from applying the policy to the second service usage activity.	The Accused Instrumentalities further "refrain from applying the policy to the second service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
161[a] The non-transitory computer-readable storage medium recited in claim 1, wherein the service usage activity is a first service usage activity, and wherein the background activity is a first background activity, and wherein	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the service usage activity is a first service usage activity, and wherein the background activity is a first background activity, and wherein the wireless network is a first wireless network, and wherein the policy is a first policy, and wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.

Claim	Public Documentation
the wireless network is a first wireless network, and wherein the policy is a first policy, and wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to:	
161[b] identify a second service usage activity of the wireless end-user device, the second service usage activity being associated with the first software component or with a second software component of the plurality of software components on the wireless end-user device, the second service usage activity comprising one or more prospective or successful communications over a second wireless network; and	The Accused Instrumentalities further "identify a second service usage activity of the wireless end-user device, the second service usage activity being associated with the first software component or with a second software component of the plurality of software components on the wireless end-user device, the second service usage activity comprising one or more prospective or successful communications over a second wireless network." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
161[c] determine whether the second service usage activity is a second background activity;	The Accused Instrumentalities further "determine whether the second service usage activity is a second background activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
161[d] if it is determined that the second service usage activity is the second background activity,	The Accused Instrumentalities "if it is determined that the second service usage activity is the second background activity, apply a second policy to the second service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.

Claim	Public Documentation
apply a second policy to the second service usage activity.	
162. The non-transitory computer-readable storage medium recited in claim 161, wherein the first policy restricts or prevents the first background activity, and wherein the second policy allows the second background activity.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 161, wherein the first policy restricts or prevents the first background activity, and wherein the second policy allows the second background activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
163[a] The non-transitory computer-readable storage medium recited in claim 1, wherein the service usage activity is a first service usage activity, and wherein the wireless network is a first wireless network, and wherein the policy is a first policy, and wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to:	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the service usage activity is a first service usage activity, and wherein the wireless network is a first wireless network, and wherein the policy is a first policy, and wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
163[b] identify a second service usage activity of the wireless end-user device, the second service usage activity being associated with the first software component or with a second software component	The Accused Instrumentalities further "identify a second service usage activity of the wireless end-user device, the second service usage activity being associated with the first software component or with a second software component of the plurality of software components on the wireless end-user device, the second service usage activity comprising one or more prospective or successful communications over a second wireless network." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.

Claim	Public Documentation
of the plurality of software components on the wireless end-user device, the second service usage activity comprising one or more prospective or successful communications over a second wireless network; and	
163[c] apply a second policy to the second service usage activity.	The Accused Instrumentalities further "apply a second policy to the second service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
164. The non-transitory computer-readable storage medium recited in claim 163, wherein the second policy comprises a control policy, a notification policy, or an accounting policy associated with the first software component or the second software component.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 163, wherein the second policy comprises a control policy, a notification policy, or an accounting policy associated with the first software component or the second software component." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
165[a] The non-transitory computer-readable storage medium recited in claim 1, wherein the service usage activity is a first service usage activity, and wherein the one or more prospective or successful communications over the wireless network are first one or more prospective or successful communications over the first wireless network, and wherein the	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the service usage activity is a first service usage activity, and wherein the one or more prospective or successful communications over the wireless network are first one or more prospective or successful communications over the first wireless network, and wherein the background activity is a first background activity, and wherein the user input obtained through the user interface of the wireless end-user device is a first user input, and wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.

Claim	Public Documentation
background activity is a first background activity, and wherein the user input obtained through the user interface of the wireless end-user device is a first user input, and wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to:	
165[b] identify a second service usage activity of the wireless end-user device, the second service usage activity being associated with a second software component of the plurality of software components on the wireless end-user device, the second service usage activity comprising second one or more prospective or successful communications over the wireless network;	The Accused Instrumentalities further "identify a second service usage activity of the wireless end-user device, the second service usage activity being associated with a second software component of the plurality of software components on the wireless end-user device, the second service usage activity comprising second one or more prospective or successful communications over the wireless network." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
165[c] determine whether the second service usage activity is a second background activity; and	The Accused Instrumentalities further "determine whether the second service usage activity is a second background activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
165[d] if it is determined that the second service usage activity is the second background activity,	The Accused Instrumentalities "if it is determined that the second service usage activity is the second background activity, apply at least a portion of the policy, wherein the at least a portion of the policy is based on a second user input."

Claim	Public Documentation
apply at least a portion of the policy, wherein the at least a portion of the policy is based on a second user input.	*See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
166[a] The non-transitory computer-readable storage medium recited in claim 1, wherein the service usage activity is a first service usage activity, and wherein the one or more prospective or successful communications over the wireless network are first one or more prospective or successful communications over the wireless network, and wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to:	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the service usage activity is a first service usage activity, and wherein the one or more prospective or successful communications over the wireless network are first one or more prospective or successful communications over the wireless network, and wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
166[b] identify a second service usage activity of the wireless end-user device, the second service usage activity being associated with a second software component of the plurality of software components on the wireless end-user device, the second service usage activity comprising second one or more prospective or successful	The Accused Instrumentalities further "identify a second service usage activity of the wireless end-user device, the second service usage activity being associated with a second software component of the plurality of software components on the wireless end-user device, the second service usage activity comprising second one or more prospective or successful communications over the wireless network." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.

Claim	Public Documentation
communications over the wireless network;	
166[c] determine whether the second service usage activity is the background activity; and	The Accused Instrumentalities further "determine whether the second service usage activity is the background activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
166[d] if it is determined that the second service usage activity is the background activity, refrain from applying at least a portion of the policy.	The Accused Instrumentalities "if it is determined that the second service usage activity is the background activity, refrain from applying at least a portion of the policy." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
167[a] The non-transitory computer-readable storage medium recited in claim 1, wherein the background activity is a first background activity, and wherein the service usage activity is a first service usage activity, and wherein the one or more prospective or successful communications over the wireless network are first one or more prospective or successful communications over the wireless network, and wherein the policy is a first policy, and wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to:	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the background activity is a first background activity, and wherein the service usage activity is a first service usage activity, and wherein the one or more prospective or successful communications over the wireless network are first one or more prospective or successful communications over the wireless network, and wherein the policy is a first policy, and wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.

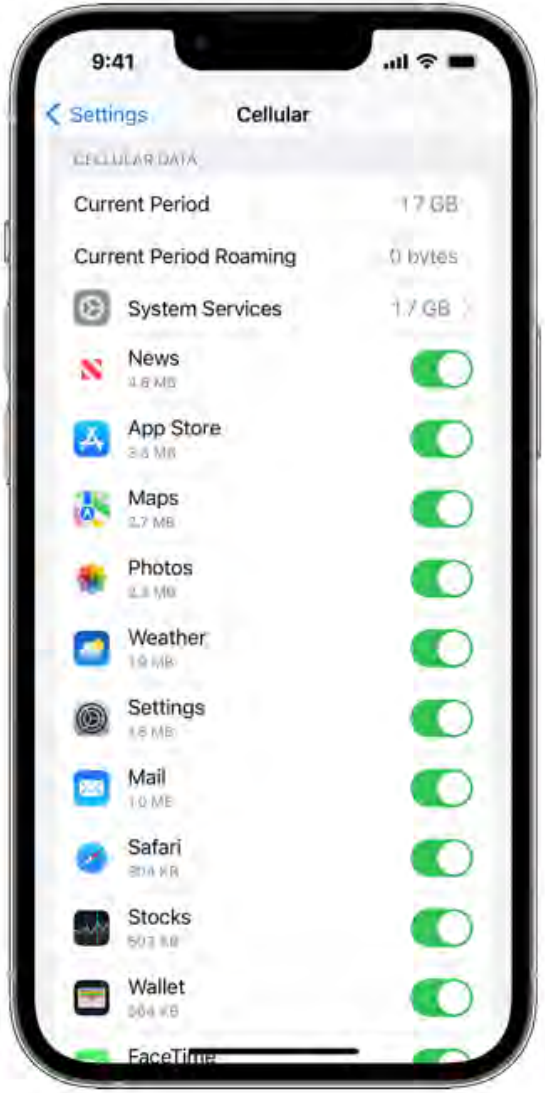
Claim	Public Documentation
167[b] identify a second service usage activity of the wireless end-user device, the second service usage activity being associated with a second software component of the plurality of software components on the wireless end-user device, the second service usage activity comprising second one or more prospective or successful communications over the wireless network;	The Accused Instrumentalities further "identify a second service usage activity of the wireless end-user device, the second service usage activity being associated with a second software component of the plurality of software components on the wireless end-user device, the second service usage activity comprising second one or more prospective or successful communications over the wireless network." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
167[c] determine whether the second service usage activity is a second background activity;	The Accused Instrumentalities further "determine whether the second service usage activity is a second background activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
167[d] obtain a second policy, the second policy to be applied when the second service usage activity is the second background activity, the second policy for controlling the second service usage activity; and	The Accused Instrumentalities further "obtain a second policy, the second policy to be applied when the second service usage activity is the second background activity, the second policy for controlling the second service usage activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
167[e] if it is determined that the second service usage activity is the second background activity, apply the second policy.	The Accused Instrumentalities "if it is determined that the second service usage activity is the second background activity, apply the second policy." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.

Claim	Public Documentation
168. The non-transitory computer-readable storage medium recited in claim 167, wherein the first policy, the second policy, or both are based on a network busy state, a network availability state, or a cost associated with the wireless network.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 167, wherein the first policy, the second policy, or both are based on a network busy state, a network availability state, or a cost associated with the wireless network." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
169[a] The non-transitory computer-readable storage medium recited in claim 1, wherein the service usage activity is a first service usage activity, and wherein the one or more prospective or successful communications over the wireless network are first one or more prospective or successful communications over the wireless network, and wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to:	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the service usage activity is a first service usage activity, and wherein the one or more prospective or successful communications over the wireless network are first one or more prospective or successful communications over the wireless network, and wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
169[b] identify a second service usage activity of the wireless end-user device, the second service usage activity being associated with the first software component, the second service usage activity com-	The Accused Instrumentalities comprise "identify a second service usage activity of the wireless end-user device, the second service usage activity being associated with the first software component, the second service usage activity comprising second one or more prospective or successful communications over the wireless network." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.

Claim	Public Documentation
prising second one or more prospective or successful communications over the wireless network;	
169[c] determine whether the second service usage activity is the background activity; and	The Accused Instrumentalities comprise "determine whether the second service usage activity is the background activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
169[d] if it is determined that the second service usage activity is the background activity, apply at least a portion of the policy.	The Accused Instrumentalities comprise "if it is determined that the second service usage activity is the background activity, apply at least a portion of the policy." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
170. The non-transitory computer-readable storage medium recited in claim 1, wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to monitor the service usage activity, account for the service usage activity, report information about the service usage activity, or a combination of these.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to monitor the service usage activity, account for the service usage activity, report information about the service usage activity, or a combination of these." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78. As a further example, the Accused Instrumentalities monitor, account for, and/or report information about service usage activities. *See, e.g.,* https://support.apple.com/en-us/HT201299:

View how much data you're using

To see how much cellular data you've used, go to Settings > Cellular or Settings > Mobile Data. If you're using an iPad, you might see Settings > Cellular Data instead.



- Scroll down to find which apps are using cellular data. If you don't want an app to use cellular data, you can turn it off for that app. When cellular data is off, apps will use only Wi-Fi for data.
- To see the cellular data usage for individual System Services, go to Settings > Cellular or Settings > Mobile Data. Then tap System Services, in the list under Cellular Data. Cellular data can't be turned on or off for individual System Services.
- You can view the data-usage statistics for an app from a current period, or view app data statistics for apps that use data when you were roaming. To reset these statistics, go to Settings > Cellular or Settings > Mobile Data, and tap Reset Statistics.
- When you're using an iPhone with Dual SIM, you can see how much cellular data you've used with your selected cellular data number.

To get the most accurate cellular data usage from a current period, contact your carrier.

Claim	Public Documentation
171. The wireless end-user device embodying the non-transitory computer-readable storage medium recited in claim 1.	The Accused Instrumentalities "embody[] the non-transitory computer-readable storage medium recited in claim 1." *See*, for example, the disclosures identified for claim 1.
172. The non-transitory computer-readable storage medium recited in claim 1, wherein the network element comprises a service controller, a server, a cloud element, or a billing element.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein the network element comprises a service controller, a server, a cloud element, or a billing element." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
173. The non-transitory computer-readable storage medium recited in claim 1, wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to provide information about the service usage activity to the network element.	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 1, wherein, when executed by the one or more processors of the wireless end-user device, the machine-executable instructions further cause the one or more processors to provide information about the service usage activity to the network element." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, and 78.
174[a] The non-transitory computer-readable storage medium recited in claim 173, wherein the information about the service usage activity comprises a count of data traffic associated with the service usage activity, a transaction	The Accused Instrumentalities comprise "non-transitory computer-readable storage medium recited in claim 173, wherein the information about the service usage activity comprises a count of data traffic associated with the service usage activity, a transaction count, a message count, a connection time, a connection duration, a classification of traffic, an indication that a measure of the service usage activity satisfies a condition relative to a threshold, a parameter associated with the service usage activity, an indication that the background activity is restricted, or a combination of these."

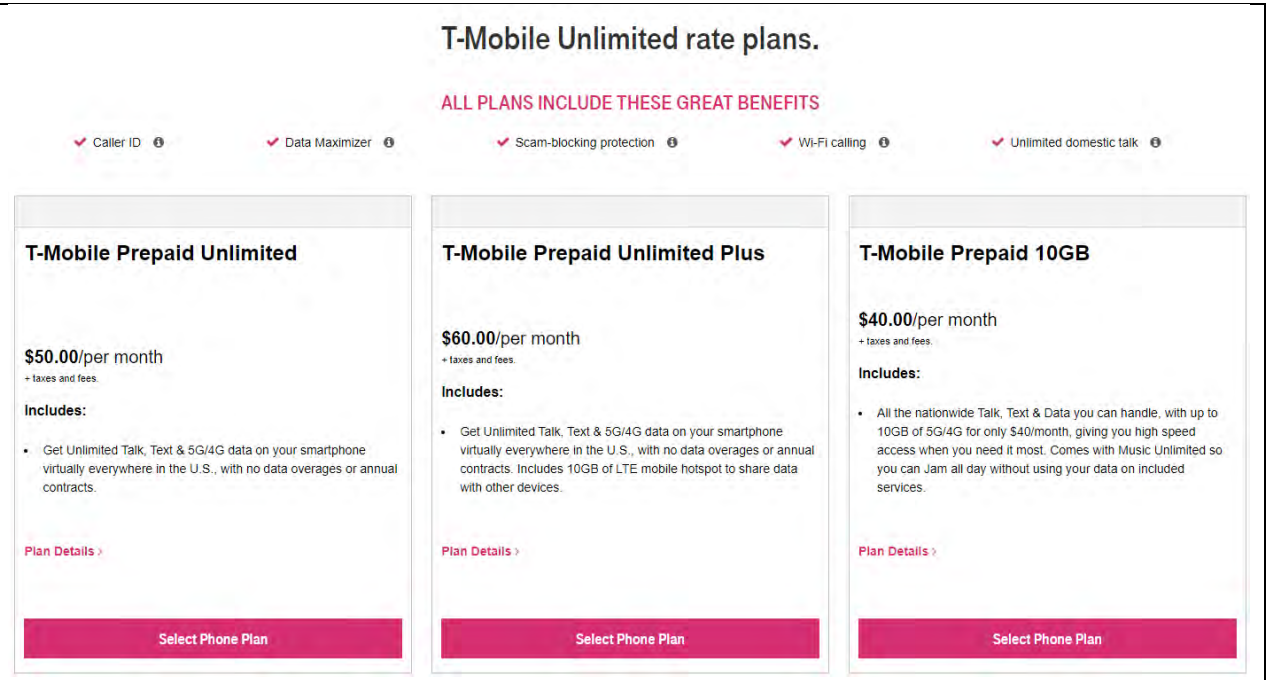
Claim	Public Documentation
count, a message count, a connection time, a connection duration, a classification of traffic, an indication that a measure of the service usage activity satisfies a condition relative to a threshold, a parameter associated with the service usage activity, an indication that the background activity is restricted, or a combination of these.	*See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, 78, and 173.
174[b] identify a second service usage activity of the wireless end-user device, the second service usage activity being associated with the first software component, the second service usage activity comprising second one or more prospective or successful communications over the wireless network;	The Accused Instrumentalities further "identify a second service usage activity of the wireless end-user device, the second service usage activity being associated with the first software component, the second service usage activity comprising second one or more prospective or successful communications over the wireless network." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, 78, and 173.
174[c] determine whether the second service usage activity is the background activity; and	The Accused Instrumentalities further "determine whether the second service usage activity is the background activity." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, 78, and 173.
174[d] if it is determined that the second service usage activity is the background activity, apply at least a portion of the policy.	The Accused Instrumentalities "if it is determined that the second service usage activity is the background activity, apply at least a portion of the policy." *See*, for example, the disclosures identified for claims 1-6, 8-9, 14, 24, 25, 78, and 173.

Exhibit 3 - U.S. Patent No. 8,924,543 ("'543 Patent")

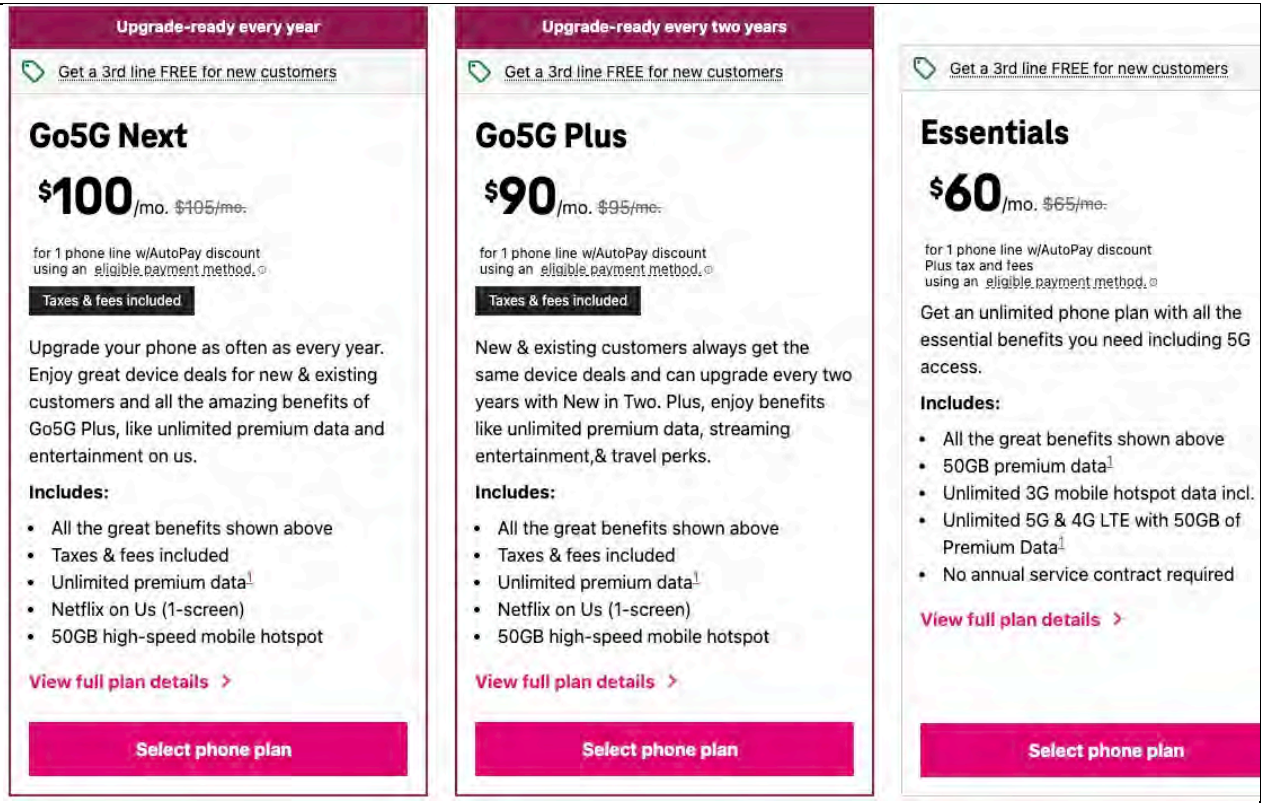
Accused Instrumentalities: smartphones, basic phones, tablets, laptops, and hotspot devices sold (including those sold in bundles with data plans) or used by T-Mobile for use with T-Mobile's wireless network services, and all versions and variations thereof since the issuance of the asserted patent.

Claim 1

Issued Claim(s)	Public Documentation
1[a] A network service plan provisioning system communicatively coupled to a wireless end-user device over a wireless access network, the network service plan provisioning system comprising one or more network elements configured to:	To the extent the preamble is limiting, T-Mobile's Accused Instrumentalities comprise a network service plan provisioning system communicatively coupled to wireless end-user devices over a wireless access network, with the wireless access network comprising one or more network elements. T-Mobile offers telecommunications service plans to customers that are provided through various network elements such as telecommunications base stations and cell sites, edge servers, and other telecommunications servers. T-Mobile provides various network service plans to customers for purchase, including through the T-Mobile.com website as well as through T-Mobile-provided services such as its pre-paid mobile service category, T-Mobile Prepaid Unlimited. *See, e.g.*:

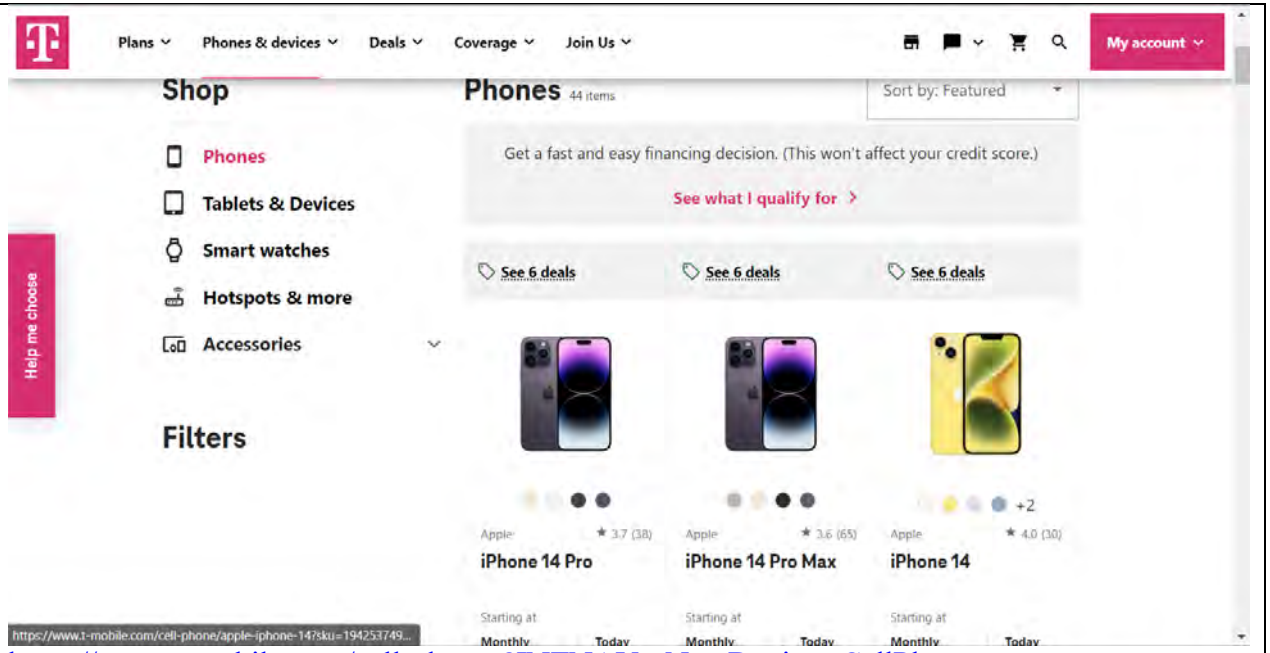


https://prepaid.t-mobile.com/plan-detail/t-mobile-prepaid-plans

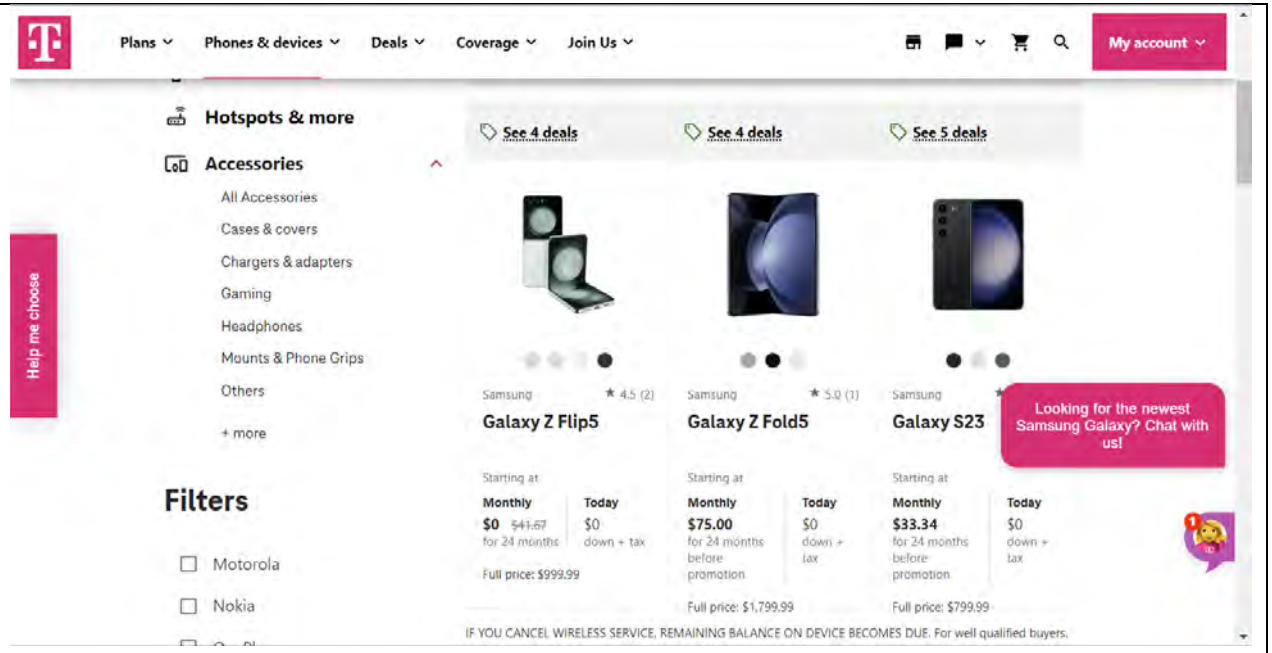


https://www.t-mobile.com/cell-phone-plans

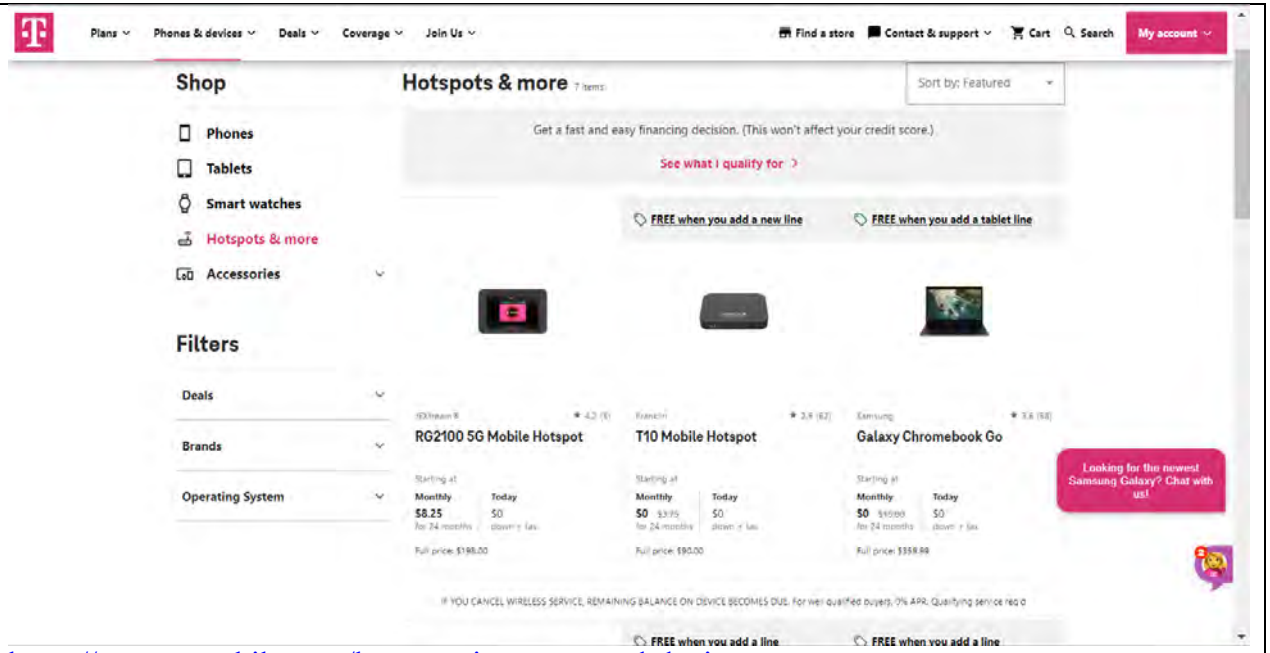
T-Mobile sells mobile devices such as phones, tablets, and hotspot access points which communicate with the T-Mobile wireless service network, which is a wireless access network. Such devices comprise end-user devices, as do devices which customers purchase elsewhere and "bring" to the T-Mobile network. *See, e.g.*:

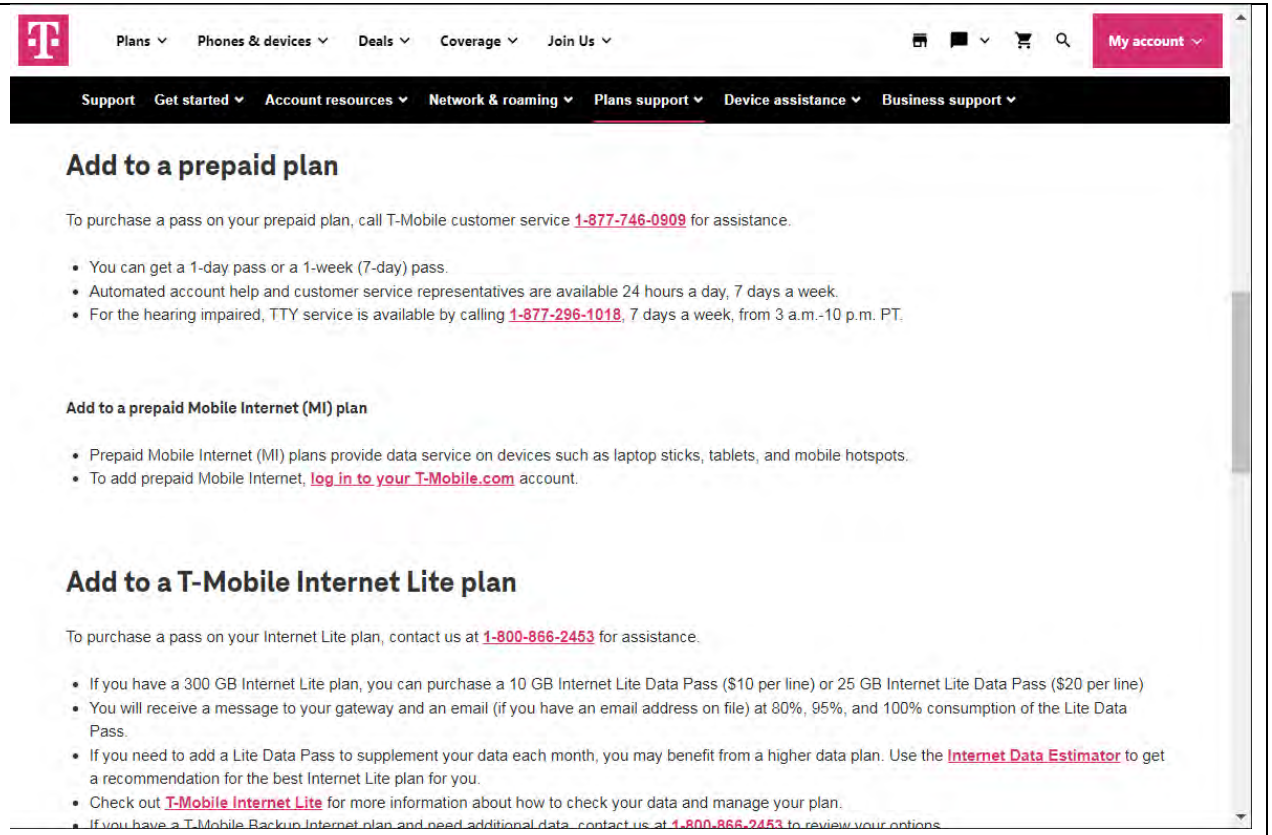


https://www.t-mobile.com/cell-phones?INTNAV=tNav:Devices:CellPhones



https://www.t-mobile.com/cell-phones/brand/samsung

	 https://www.t-mobile.com/hotspots-iot-connected-devices
1[b] obtain and store a first service plan component and a second service plan component,	The Accused Instrumentalities obtain and store a first service plan component and a second service plan component. The devices of subscribers of T-Mobile's wireless network services may be provisioned with different service plans by T-Mobile's wireless access network, with each plan, for example, carrying data that is tracked and accounted for differently. The Accused Instrumentalities use different service plans to provide service, for example, to mobile hotspot devices, mobile phones and tablets provisioned with an "unlimited" data plan, mobile phones and tablets provisioned with a prepaid plan, mobile phones and tablets which for which the associated subscriber account has reached its allotted data limit for the service period, and mobile phones and tablets which are specifically communicating with T-Mobile servers to purchase or increase data allotments (e.g., a T-Mobile "Data Pass"). *See, e.g.*:



https://www.t-mobile.com/support/plans-features/data-passes#prepaid

Activation steps

If you don't have a plan that includes HD streaming, refer to Find the right plan for you to add a plan today.

From the T-Mobile app

1. Open the T-Mobile app. If you don't have it, learn how to download it now.
2. Tap **MORE**
3. Go to **PROFILE SETTINGS**
4. Go to **MEDIA SETTINGS**.
5. If you have multiple lines on your account, make sure the line you're making changes to is showing. If it's not, open the menu to select another line o account.
6. Next to **HD Video Resolution**, toggle it **ON** or **OFF**.

From T-Mobile.com

1. Log in to T-Mobile.com with your T-Mobile ID. If you don't have one, register for a T-Mobile ID.
2. Select **PROFILE**.
3. Go to **MEDIA SETTINGS**.
4. By **HD Video Resolution**, set the option to **ON** or **OFF**.

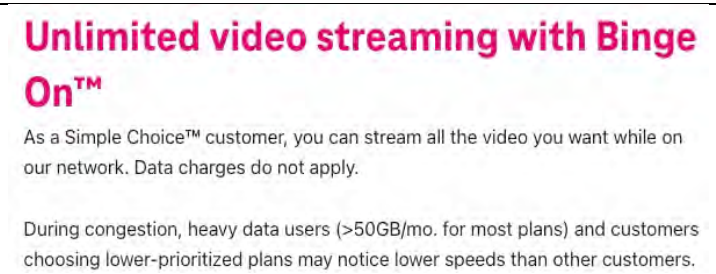
HD video resolution details

- Activating HD video resolution only provides the ability to enable higher-resolution video streams by turning off video optimization. It doesn't change t actual, available resolution of streaming video.
- Video resolution isn't determined by T-Mobile, but rather it's determined by the video content provider like YouTube or Netflix.
- Once you turn it on, HD video streaming availability should take effect immediately, but it may require closing and re-opening the app or browser win restarting your device.

Full terms

All on-network data used, including free streaming data, counts toward the heavy-user threshold of 50GB in a billing cycle, after which a T-Mobile-brand customer will no longer receive highest priority on the network. When an HD video is active, streaming high-definition video will use data much faster tha optimized video, and brings up to the possibility of de-prioritization if you use enough data to reach that limit in a given month. (Learn more about T-Mobi Open Internet disclosures.)

https://www.t-mobile.com/support/plans-features/activate-hd-video-streaming

	 https://www.t-mobile.com/tv-streaming/binge-on To provide the best possible experience for the most possible customers on their T-Mobile-branded plans, and to minimize capacity issues and degradation in network performance, we manage significant high-speed data usage on the vast majority of our plans through prioritization. Heavy Data Users (as defined by a customer's rate plan) will have their data usage prioritized below the data usage (including tethering) of other customers at times and at locations where there are competing customer demands for network resources, which may result in slower data speeds. At the start of the next bill cycle, the customer's usage status is reset, and this data traffic is no longer prioritized below other traffic. Customers who use data in violation of their Rate Plan terms or T-Mobile's Terms and Conditions may be excluded from this calculation. Data features that may not count against the high-speed data allotment for some plans, such as certain data associated with Music Freedom, or Binge On, still count towards all customers' usage for this calculation. Smartphone Mobile HotSpot (tethering) data is also included in this calculation. Data used for customer service applications, such as the T-Mobile My Account app does not count towards customers' usage for this calculation. To help avoid application of this practice, and reduce mobile data consumption, customers can set automatic updating of apps, podcasts and file downloads to run off Wi-Fi (making sure to connect to Wi-Fi to update applications and system periodically). https://www.t-mobile.com/responsibility/consumer-info/policies/internet-service
1[c] the first service plan component comprising (1) information specifying a first traffic classification filter for filtering a traffic event in a network traffic inspection system, the traffic event being associated with the wireless end-user device and (2) a first network policy	The Accused Instrumentalities have "first service plan component[s]" "comprising (1) information specifying a first traffic classification filter for filtering a traffic event in a network traffic inspection system, the traffic event being associated with the wireless end-user device and (2) a first network policy enforcement action that is triggered in a network policy enforcement system when the traffic event possesses a characteristic that matches the first traffic classification filter."

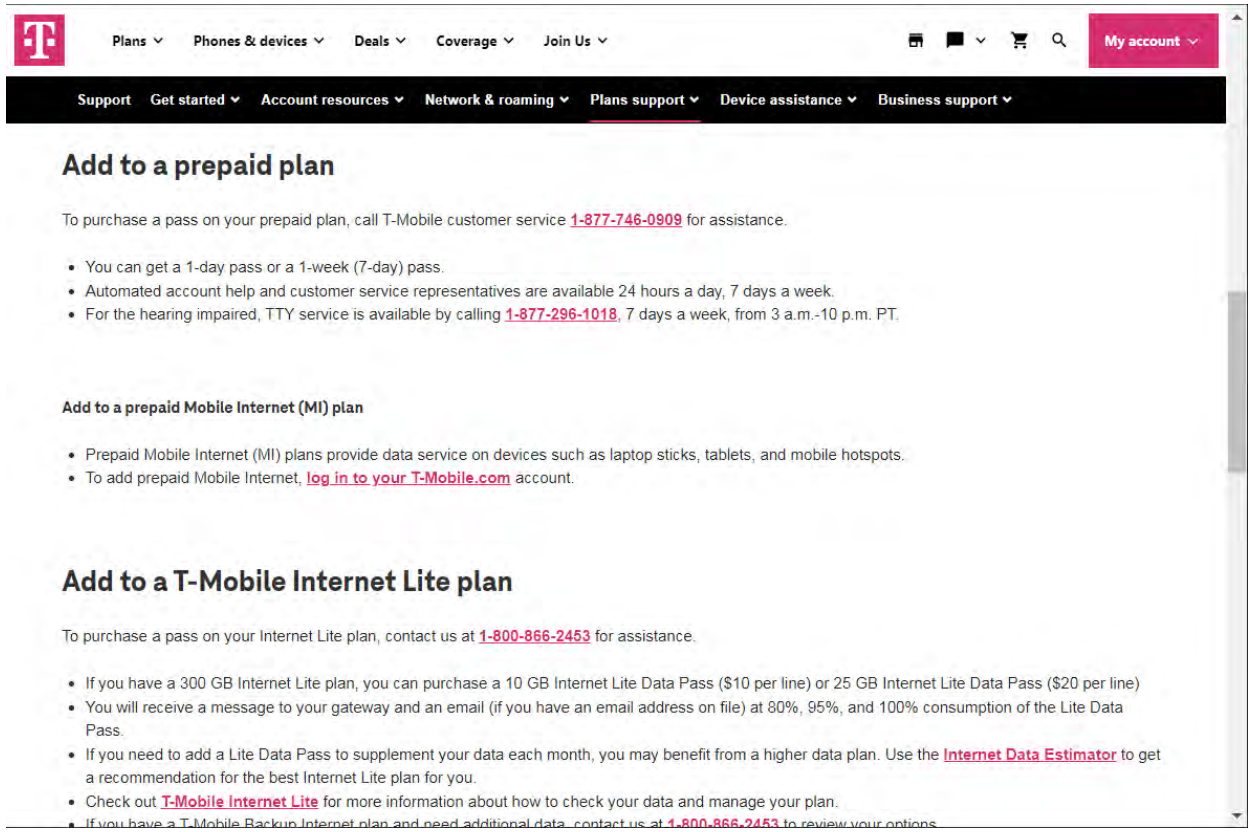
enforcement action that is triggered in a network policy enforcement system when the traffic event possesses a characteristic that matches the first traffic classification filter, and 1[d] the second service plan component comprising (a) information specifying a second traffic classification filter for filtering the traffic event in the network traffic inspection system, and (b) a second network policy enforcement action that is triggered in the network policy enforcement system when the traffic event possesses a characteristic that matches the second traffic classification filter;	Examples of such first service plan components include, for example, special video streaming plans or options (e.g., T-Mobile HD Streaming, https://www.t-mobile.com/support/plans-features/activate-hd-video-streaming/), hotspot data plans, and special network access rules for user devices when the devices attempt to purchase additional data from T-Mobile. *See, e.g.*: **Activation steps** If you don't have a plan that includes HD streaming, refer to Find the right plan for you to add a plan today. **From the T-Mobile app** 1. Open the T-Mobile app. If you don't have it, learn how to download it now. 2. Tap **MORE** 3. Go to **PROFILE SETTINGS** 4. Go to **MEDIA SETTINGS**. 5. If you have multiple lines on your account, make sure the line you're making changes to is showing. If it's not, open the menu to select another line o account. 6. Next to **HD Video Resolution**, toggle it **ON** or **OFF**. **From T-Mobile.com** 1. Log in to T-Mobile.com with your T-Mobile ID. If you don't have one, register for a T-Mobile ID. 2. Select **PROFILE**. 3. Go to **MEDIA SETTINGS**. 4. By **HD Video Resolution**, set the option to **ON** or **OFF**. **HD video resolution details** • Activating HD video resolution only provides the ability to enable higher-resolution video streams by turning off video optimization. It doesn't change t actual, available resolution of streaming video. • Video resolution isn't determined by T-Mobile, but rather it's determined by the video content provider like YouTube or Netflix. • Once you turn it on, HD video streaming availability should take effect immediately, but it may require closing and re-opening the app or browser win restarting your device. **Full terms** All on-network data used, including free streaming data, counts toward the heavy-user threshold of 50GB in a billing cycle, after which a T-Mobile-brand customer will no longer receive highest priority on the network. When an HD video is active, streaming high-definition video will use data much faster tha optimized video, and brings up to the possibility of de-prioritization if you use enough data to reach that limit in a given month. (Learn more about T-Mobi Open Internet disclosures.) https://www.t-mobile.com/support/plans-features/activate-hd-video-streaming

Unlimited video streaming with Binge On™

As a Simple Choice™ customer, you can stream all the video you want while on our network. Data charges do not apply.

During congestion, heavy data users (>50GB/mo. for most plans) and customers choosing lower-prioritized plans may notice lower speeds than other customers.

https://www.t-mobile.com/tv-streaming/binge-on



https://www.t-mobile.com/support/plans-features/data-passes#prepaid

Data passes

Pass options

- On-Demand data passes:
  - Temporarily add high-speed data to your account and can be added to extend your monthly available high-speed data.
  - Once the high-speed data bucket is reached, unlimited data continues at reduced speeds. To continue service with high-speed data, another pass must be purchased.
  - On-Demand passes can be purchased with refill cards or prepaid service account balances.
- One-Day HD Video Streaming passes:
  - May be available in the US on the T-Mobile network only.
  - Prepaid HD Streaming passes do not have a resolution cap.
  - HD streaming is not available when roaming in Canada, Mexico, or while roaming.

Add data or HD streaming pass

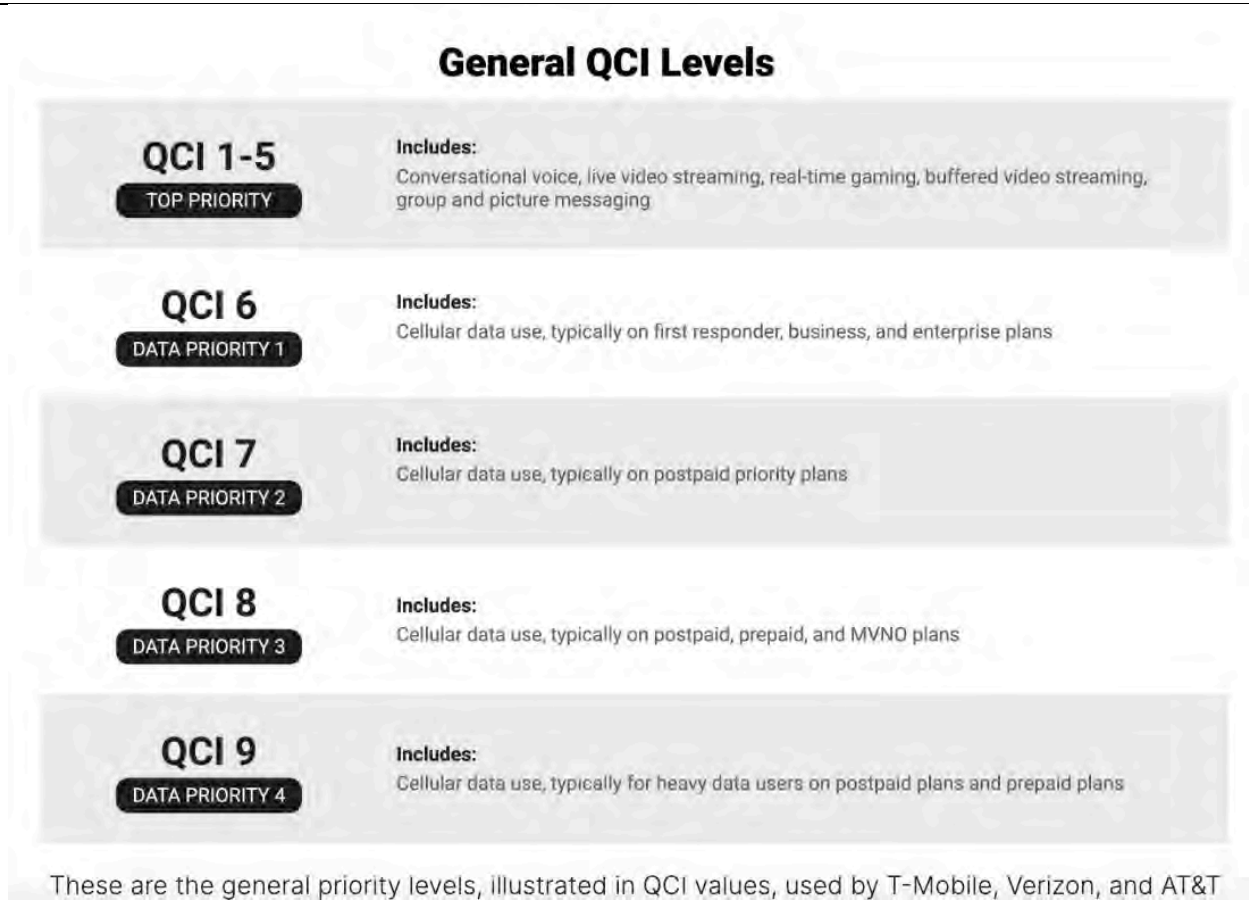
1. Log in to your T-Mobile Prepaid account.
2. Go to **Line Details** from the homepage or main.
3. Select **Add On-Demand passes**.
4. Select from available services.
5. Select **Set order date and time**.
6. **Add to cart** and complete the purchase

https://www.t-mobile.com/support/plans-features/data-maximizer-for-prepaid-plansa

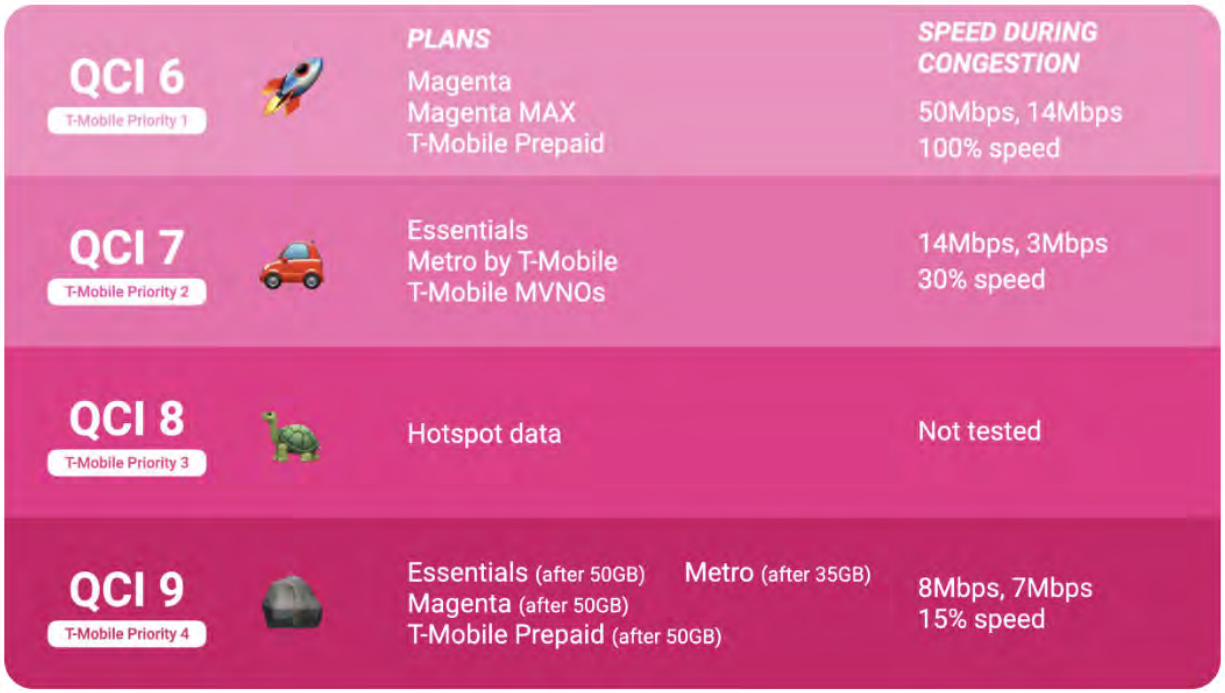
To provide the best possible experience for the most possible customers on their T-Mobile-branded plans, and to minimize capacity issues and degradation in network performance, we manage significant high-speed data usage on the vast majority of our plans through prioritization. Heavy Data Users (as defined by a customer's rate plan) will have their data usage prioritized below the data usage (including tethering) of other customers at times and at locations where there are competing customer demands for network resources, which may result in slower data speeds. At the start of the next bill cycle, the customer's usage status is reset, and this data traffic is no longer prioritized below other traffic. Customers who use data in violation of their Rate Plan terms or T-Mobile's Terms and Conditions may be excluded from this calculation. Data features that may not count against the high-speed data allotment for some plans, such as certain data associated with Music Freedom, or Binge On, still count towards all customers' usage for this calculation. Smartphone Mobile HotSpot (tethering) data is also included in this calculation. Data used for customer service applications, such as the T-Mobile My Account app does not count towards customers' usage for this calculation. To help avoid application of this practice, and reduce mobile data consumption, customers can set automatic updating of apps, podcasts and file downloads to run off Wi-Fi (making sure to connect to Wi-Fi to update applications and system periodically).

	https://www.t-mobile.com/responsibility/consumer-info/policies/internet-service Service plans provided through the Accused Instrumentalities involve differentiating between different types of data traffic, including for example detecting and differentiating for data usage accounting purposes what data is used for video streaming at a user device, what data is used for hotspot or tethering purposes at a user device. Detection of different types of traffic by the Accused Instrumentalities result in the filtering of those traffic events in a network traffic inspection system. The Accused Instrumentalities further execute network policy enforcement actions in response to the detection of certain types of data traffic. As an example, the traffic classification filter for detecting a request from a user device to purchase additional data comprises a first traffic classification filter, and the traffic classification filter for detecting traffic not related to a user's request to purchase additional data comprises a second traffic classification filter. As another example, the traffic classification filter for detecting a device's request for streaming video data comprises a first traffic classification filter, and the traffic classification filter for detecting a device's request for non-video-streaming data comprises a second traffic classification filter.
1[e] process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter, the network provisioning instruction set comprising one or more traffic inspection provisioning instructions for the network traffic inspection system and one or more policy enforcement provisioning instructions for the network policy enforcement system, the network traffic inspection system and the network policy enforcement system implementing one or	The Accused Instrumentalities process service plan components to create a network provisioning instruction set in accordance with a prioritization of a first traffic classification filter over a second traffic classification filter. As one example, the Accused Instrumentalities process various service plan components for a particular service plan for a subscriber, including the claimed first and second service plan components, to create network provisioning instructions defined by logic for prioritizing one traffic classification filter over another. For example, the Accused Instrumentalities utilize traffic inspection and other techniques to determine whether a user of a device connected to the wireless access network is requesting additional data to use on the wireless access network, and to further prioritize such data traffic as a part of the network provisioning instructions and to enforce their priority by, for example, specifically configuring the device to access the wireless access network for the purpose of purchasing additional data to use on the wireless access network. Another example of traffic classification filters which result in the network policy enforcement system causing policies to be applied to the user device would be the Accused Instrumentalities' traffic classification filters for inspecting traffic and detecting traffic related to video streaming and HD video streaming, which results in the network policy enforcement system implementing policies to for setting

more policies applicable to the wireless end-user device;	maximum bandwidth for a particular traffic stream based on whether the subscriber account is configured by the Accused Instrumentalities as being allowed to stream HD video or not; if HD video streaming is permitted (e.g., the subscriber account has paid for a "HD Streaming Pass" add-on functionality), the traffic classification filter for detecting data traffic for HD streaming video is prioritized. As another example, the Accused Instrumentalities apply different access priority rules based on the type of subscriber account, where a first service plan component and a second service plan component may refer to the service plans of two different subscriber plans. As another example, a traffic classification filter for inspecting and detecting hotspot data is used to enforce the relatively lower levels of service priority that carriers, including T-Mobile, accord to hotspot data over other more data such as data used by accounts determined by the Accused Instrumentalities to be for "first responder" use. *See, e.g.*:



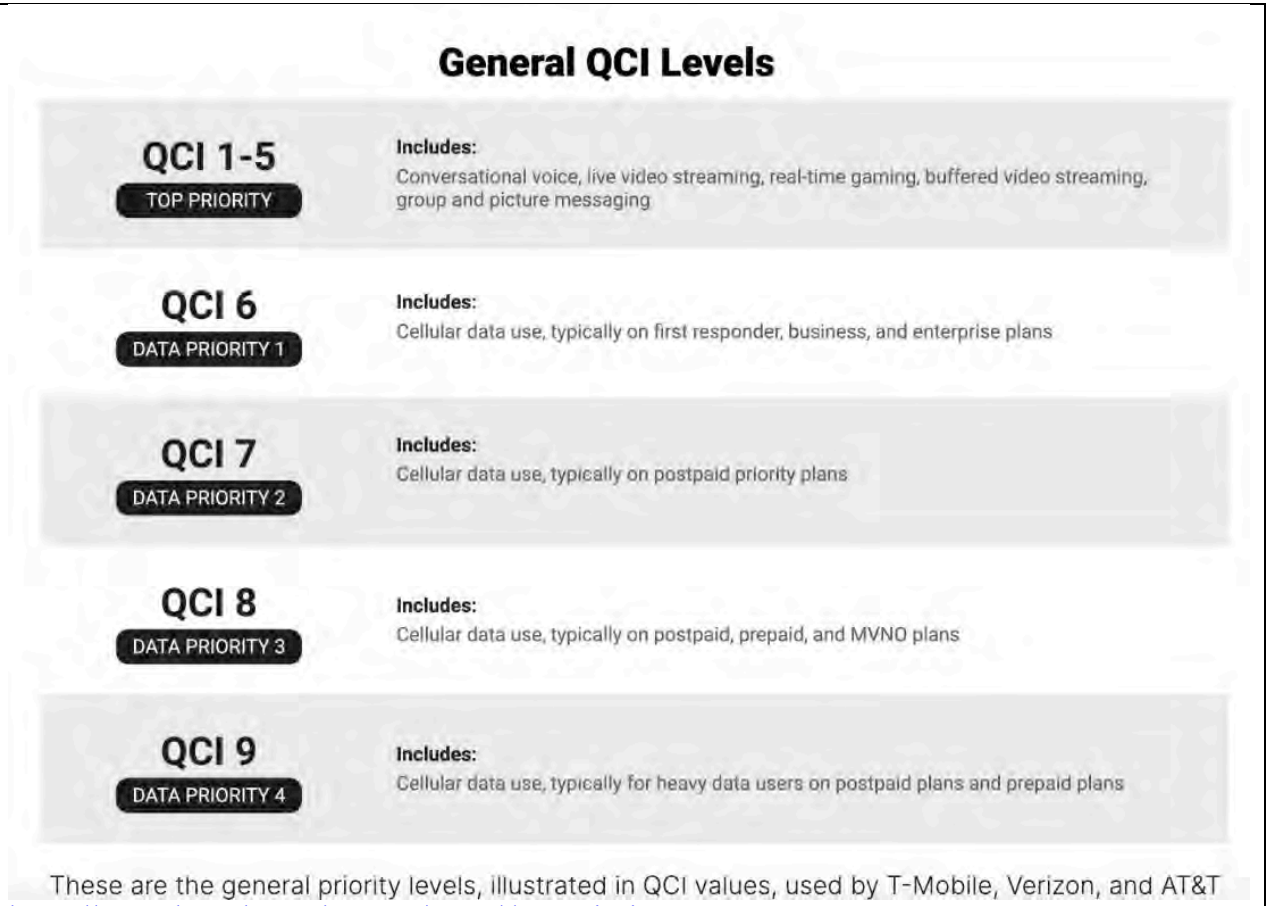
These are the general priority levels, illustrated in QCI values, used by T-Mobile, Verizon, and AT&T
https://www.bestphoneplans.net/news/data-priority



https://www.bestphoneplans.net/news/data-priority

	What speeds and performance can T-Mobile-branded Broadband Internet Access Services customers expect? Where are these speeds available? Many factors affect the speed and performance that customers experience, including the programs or services running on the device, proximity to a cell site, the capacity of the cell site, weather, the surrounding terrain, use inside a building or moving vehicle, radio frequency interference, how many other customers are attempting to use the same spectrum resources, any high-speed data allotment, the rate plans or features you select, and uses that affect your network prioritization, such as whether you are using Smartphone Mobile HotSpot (tethering) or if you are a Heavy Data User. For most T-Mobile-branded rate plans (as well as for most legacy Sprint-branded rate plans for customers who have not yet transitioned), a "Heavy Data User" is defined as a customer using more than 50GB of data (100GB of data for new Magenta plans activated beginning February 24, 2021) in a billing cycle. The threshold number is periodically evaluated across our rate plans and brands to manage network traffic and deliver a good experience to all customers while offering a range of customer choices. You can always check the threshold amount for a rate plan by speaking with a representative, review our rate cards or T-Mobile.com, or by logging in to my.t-mobile.com, or the T-Mobile app. The term "Heavy Data User" does not apply to customers on Magenta MAX, a customer choice we are offering as we explore the expanding capacity of our 5G network, or on a small number of T-Mobile-branded business and government-oriented plans, which are not subject to a threshold. In addition, many T-Mobile plans use video streaming optimization when connected to the cellular network to deliver a DVD-quality (up to 2.5 Mbps) video experience with minimal buffering while streaming. T-Mobile plans optimize data streams that are identified by our packet-core network as video; video providers may also choose to establish protocols to self-optimize their video. As described above, customers may also have selected other video experiences – e.g., selecting Ultra HD video on Magenta MAX – resulting in variation in streaming quality.

	Additionally, we prioritize network data by plan and brand to deliver a range of customer choice points at great values. Data for customers on most T-Mobile-branded plans (and for customers on Sprint-branded plans while using the T-Mobile network), is prioritized before the data of customers on Essentials plans and Metro by T-Mobile or Assurance Wireless-branded plans. Mobile internet plans offered after December 12, 2020 with 30GB or more data per month, and Project 10Million and some other education-focused mobile internet plans, are prioritized next. The vast majority of customers on T-Mobile-branded, Sprint-branded, Metro by T-Mobile-branded, and Assurance Wireless-branded plans receive higher priority than the small fraction of customers who are Heavy Data Users on their rate plan, who are prioritized last on the network after exceeding the relevant threshold for the current billing cycle. T-Mobile Home Internet (available in select locations) customers receive the same network prioritization as Heavy Data Users, but should be less likely to experience congestion because the equipment is stationary and available in limited areas. https://www.t-mobile.com/responsibility/consumer-info/policies/internet-service On information and belief, the Accused Instrumentalities specifically transmit traffic control-related instructions to mobile devices in the wireless access network based on type of traffic, type of subscriber plan, and priority levels for types of data and/or subscriber account type based on the Accused Instrumentalities' inspection of traffic to and from the device and the account associated with the device.
1[f] provide the one or more traffic inspection provisioning instructions to the network traffic inspection system; and	The Accused Instrumentalities provide the one or more traffic provisioning instructions to the network traffic inspection system. As an example, the Accused Instrumentalities, by providing a traffic inspection provisioning instruction, cause and enable the traffic inspection system to inspect traffic to detect certain types of traffic and events, such as a user device attempting to use data for streaming video, HD streaming video, hotspot or tethering usage, and to purchase additional data. *See, e.g.*:



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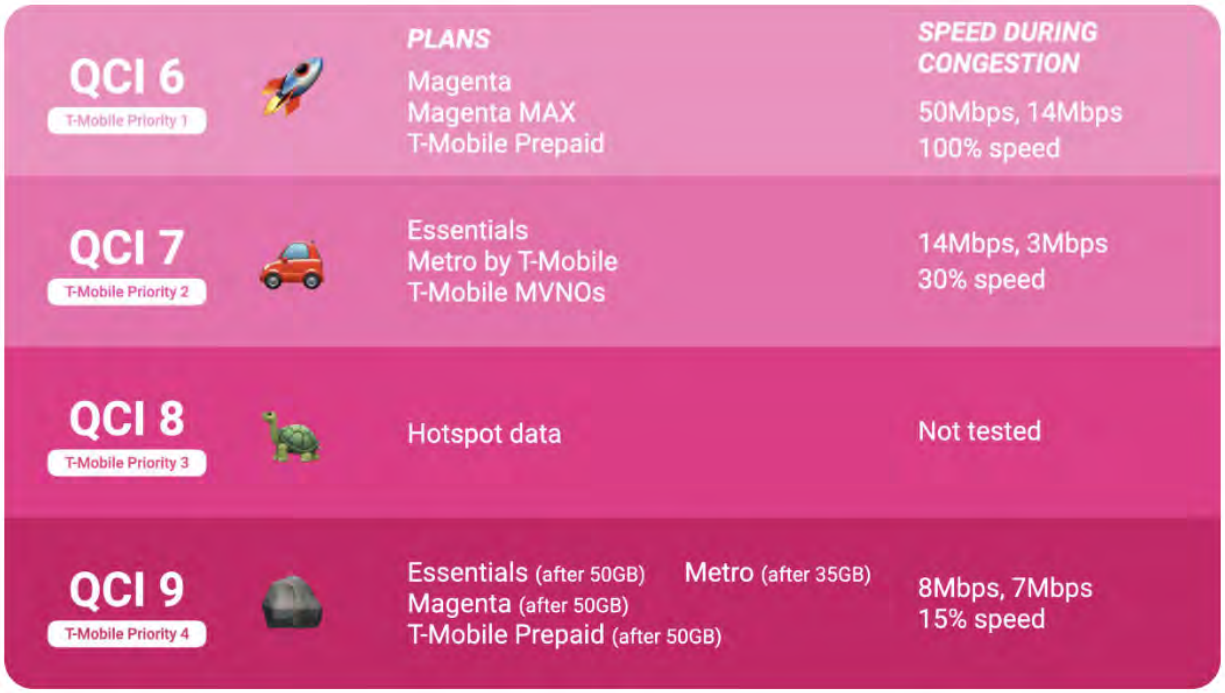
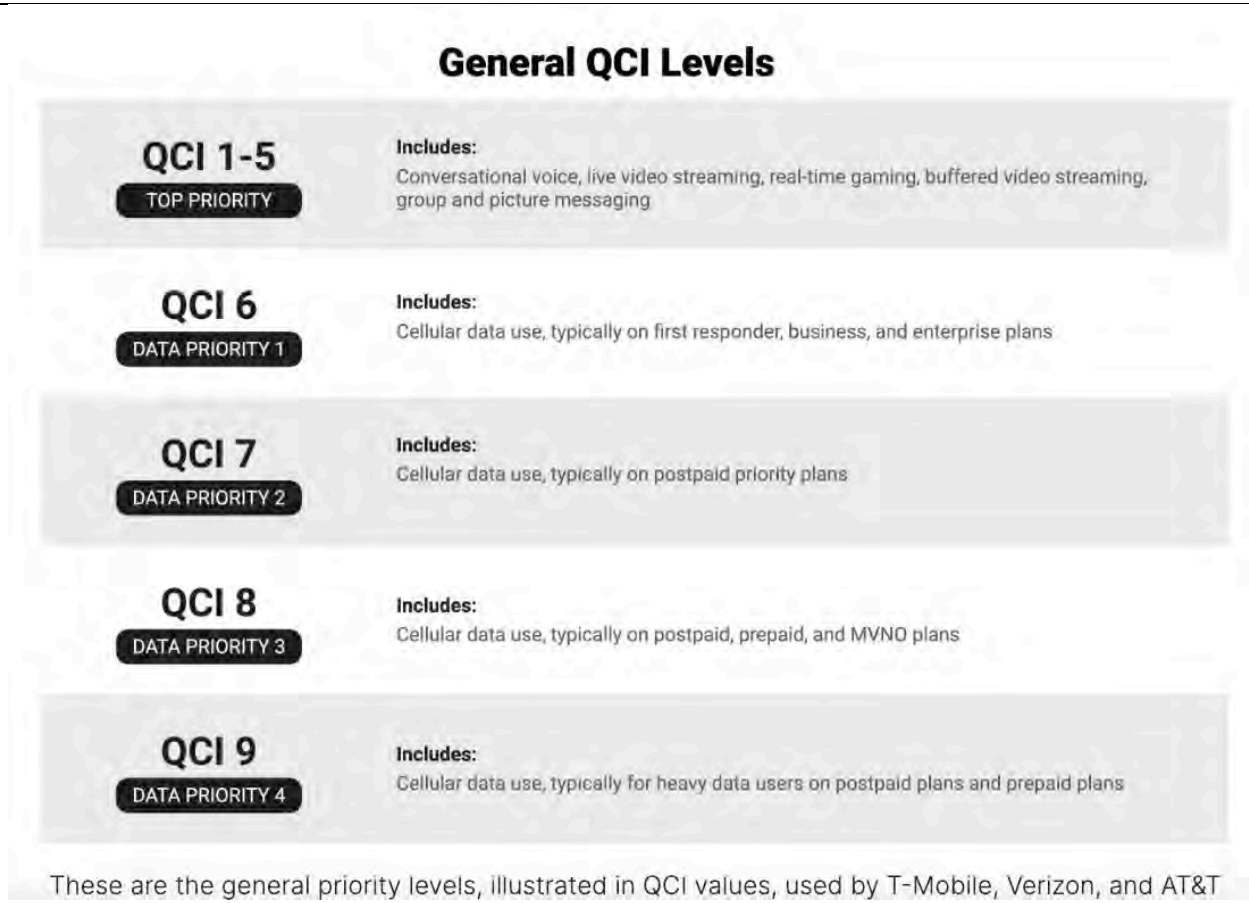
https://www.bestphoneplans.net/news/data-priority



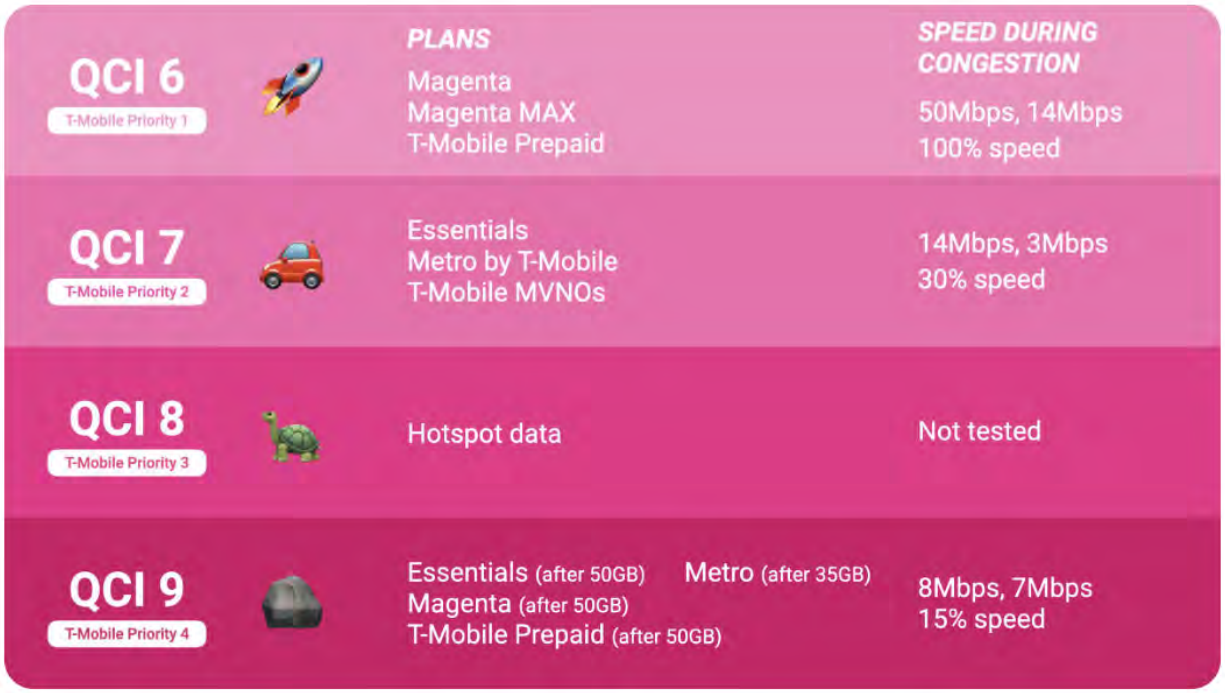
https://www.bestphoneplans.net/news/data-priority

	What speeds and performance can T-Mobile-branded Broadband Internet Access Services customers expect? Where are these speeds available? Many factors affect the speed and performance that customers experience, including the programs or services running on the device, proximity to a cell site, the capacity of the cell site, weather, the surrounding terrain, use inside a building or moving vehicle, radio frequency interference, how many other customers are attempting to use the same spectrum resources, any high-speed data allotment, the rate plans or features you select, and uses that affect your network prioritization, such as whether you are using Smartphone Mobile HotSpot (tethering) or if you are a Heavy Data User. For most T-Mobile-branded rate plans (as well as for most legacy Sprint-branded rate plans for customers who have not yet transitioned), a "Heavy Data User" is defined as a customer using more than 50GB of data (100GB of data for new Magenta plans activated beginning February 24, 2021) in a billing cycle. The threshold number is periodically evaluated across our rate plans and brands to manage network traffic and deliver a good experience to all customers while offering a range of customer choices. You can always check the threshold amount for a rate plan by speaking with a representative, review our rate cards or T-Mobile.com, or by logging in to my.t-mobile.com, or the T-Mobile app. The term "Heavy Data User" does not apply to customers on Magenta MAX, a customer choice we are offering as we explore the expanding capacity of our 5G network, or on a small number of T-Mobile-branded business and government-oriented plans, which are not subject to a threshold. In addition, many T-Mobile plans use video streaming optimization when connected to the cellular network to deliver a DVD-quality (up to 2.5 Mbps) video experience with minimal buffering while streaming. T-Mobile plans optimize data streams that are identified by our packet-core network as video; video providers may also choose to establish protocols to self-optimize their video. As described above, customers may also have selected other video experiences – e.g., selecting Ultra HD video on Magenta MAX – resulting in variation in streaming quality.

	Additionally, we prioritize network data by plan and brand to deliver a range of customer choice points at great values. Data for customers on most T-Mobile-branded plans (and for customers on Sprint-branded plans while using the T-Mobile network), is prioritized before the data of customers on Essentials plans and Metro by T-Mobile or Assurance Wireless-branded plans. Mobile internet plans offered after December 12, 2020 with 30GB or more data per month, and Project 10Million and some other education-focused mobile internet plans, are prioritized next. The vast majority of customers on T-Mobile-branded, Sprint-branded, Metro by T-Mobile-branded, and Assurance Wireless-branded plans receive higher priority than the small fraction of customers who are Heavy Data Users on their rate plan, who are prioritized last on the network after exceeding the relevant threshold for the current billing cycle. T-Mobile Home Internet (available in select locations) customers receive the same network prioritization as Heavy Data Users, but should be less likely to experience congestion because the equipment is stationary and available in limited areas. https://www.t-mobile.com/responsibility/consumer-info/policies/internet-service
1[g] provide the one or more policy enforcement provisioning instructions to the network policy enforcement system.	The Accused Instrumentalities provide the one or more policy enforcement provisioning instructions to the network policy enforcement system. As an example, the Accused Instrumentalities, by providing a policy enforcement provisioning instruction to the network policy enforcement system, is able to implement traffic control and traffic shaping techniques, including for instance throttling certain kinds of traffic (e.g., throttling video streaming), capping certain kinds of data usage (e.g., setting and applying a data cap on hotspot and tethering data usage), and prioritizing certain types of preferred data usage (e.g., communicating with the Accused Instrumentalities' servers to purchase additional data). *See, e.g.*:



These are the general priority levels, illustrated in QCI values, used by T-Mobile, Verizon, and AT&T
https://www.bestphoneplans.net/news/data-priority



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	Additionally, we prioritize network data by plan and brand to deliver a range of customer choice points at great values. Data for customers on most T-Mobile-branded plans (and for customers on Sprint-branded plans while using the T-Mobile network), is prioritized before the data of customers on Essentials plans and Metro by T-Mobile or Assurance Wireless-branded plans. Mobile internet plans offered after December 12, 2020 with 30GB or more data per month, and Project 10Million and some other education-focused mobile internet plans, are prioritized next. The vast majority of customers on T-Mobile-branded, Sprint-branded, Metro by T-Mobile-branded, and Assurance Wireless-branded plans receive higher priority than the small fraction of customers who are Heavy Data Users on their rate plan, who are prioritized last on the network after exceeding the relevant threshold for the current billing cycle. T-Mobile Home Internet (available in select locations) customers receive the same network prioritization as Heavy Data Users, but should be less likely to experience congestion because the equipment is stationary and available in limited areas. https://www.t-mobile.com/responsibility/consumer-info/policies/internet-service
2. The network service plan provisioning system of claim 1, wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises order traffic inspection comparison operations in the one or more traffic inspection provisioning instructions such that the one or more traffic inspection provisioning instructions direct the network traffic inspection system to determine whether the traffic event possesses the characteristic that matches the first traffic classification filter before determining whether the traffic event possesses the characteristic that matches the second traffic classification filter.	The Accused Instrumentalities comprise "network service plan provisioning system of claim 1, wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises order traffic inspection comparison operations in the one or more traffic inspection provisioning instructions such that the one or more traffic inspection provisioning instructions direct the network traffic inspection system to determine whether the traffic event possesses the characteristic that matches the first traffic classification filter before determining whether the traffic event possesses the characteristic that matches the second traffic classification filter." *See*, for example, the disclosures identified for claim 1. As a further example, the Accused Instrumentalities apply different access priority rules based on the type of subscriber account, where a first service plan component and a second service plan component may refer to the service plans of two different subscriber plans to order subscribers into various priorities, such as "top priority" or "QCI" level. As another example, a traffic classification filter for inspecting and detecting hotspot data is used to enforce the relatively lower levels of service priority that carriers, including T-Mobile, accord to hotspot data over other more data such as data used by accounts determined by the Accused Instrumentalities to be for "first responder" use.

3. The network service plan provisioning system of claim 2, wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter further comprises include in the network provisioning instruction set one or more instructions directing the network traffic inspection system to determine whether the traffic event possesses the characteristic that matches the second traffic classification filter only if the traffic event does not possess the characteristic that matches the first traffic classification filter.	The Accused Instrumentalities comprise "network service plan provisioning system of claim 2, wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter further comprises include in the network provisioning instruction set one or more instructions directing the network traffic inspection system to determine whether the traffic event possesses the characteristic that matches the second traffic classification filter only if the traffic event does not possess the characteristic that matches the first traffic classification filter." *See*, for example, the disclosures identified for claims 1-2. As a further example, the Accused Instrumentalities apply different access priority rules based on the type of subscriber account, where a first service plan component and a second service plan component may refer to the service plans of two different subscriber plans into various priorities based on characteristics that match certain filters, but not others.
4. The network service plan provisioning system of claim 2, wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter further comprises include in the network provisioning instruction set one or more instructions directing the network traffic inspection system to determine whether the traffic event also possesses the characteristic that matches the second traffic classification filter if the traffic event possesses the characteristic that	The Accused Instrumentalities comprise "network service plan provisioning system of claim 2, wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter further comprises include in the network provisioning instruction set one or more instructions directing the network traffic inspection system to determine whether the traffic event also possesses the characteristic that matches the second traffic classification filter if the traffic event possesses the characteristic that matches the first traffic classification filter." *See*, for example, the disclosures identified for claims 1-2. As a further example, the Accused Instrumentalities apply different access priority rules based on the type of subscriber account, where a first service plan component and a second service plan component may refer to the service plans of two different subscriber plans into various priorities based on characteristics that match more than one filter.

matches the first traffic classification filter.	
5. The network service plan provisioning system of claim 1, further comprising:	The Accused Instrumentalities comprise "network service plan provisioning system of claim 1." *See*, for example, the disclosures identified for claim 1.
[5a] a policy enforcement priority rule datastore including a policy enforcement priority rule for determining whether the traffic event possesses the characteristic that matches the first traffic classification filter before determining whether the traffic event possesses the characteristic that matches the second traffic classification filter,	The Accused Instrumentalities comprise "a policy enforcement priority rule datastore including a policy enforcement priority rule for determining whether the traffic event possesses the characteristic that matches the first traffic classification filter before determining whether the traffic event possesses the characteristic that matches the second traffic classification filter." *See*, for example, the disclosures identified for claims 1-2.
[5b] and wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises include the policy enforcement priority rule in the network provisioning instruction set.	The Accused Instrumentalities comprise "wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises include the policy enforcement priority rule in the network provisioning instruction set." *See*, for example, the disclosures identified for claims 1-3.
6. The network service plan provisioning system of claim 5, wherein the policy enforcement priority rule comprises a priority order for a plurality of traffic classification filters, the plurality of traffic classification filters including the first traffic classification filter and the second traffic classification filter.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 5, wherein the policy enforcement priority rule comprises a priority order for a plurality of traffic classification filters, the plurality of traffic classification filters including the first traffic classification filter and the second traffic classification filter." *See*, for example, the disclosures identified for claim 5. As a further example, the Accused Instrumentalities comprise a plurality of filters (e.g., QCI1 through QCI9) with rules that comprise a priority order for the plurality of filters.

7. The network service plan provisioning system of claim 5, wherein the policy enforcement priority rule comprises a priority specification for one or both of the first service plan component and the second service plan component.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 5, wherein the policy enforcement priority rule comprises a priority specification for one or both of the first service plan component and the second service plan component." *See*, for example, the disclosures identified for claim 5.
8. The network service plan provisioning system of claim 1, wherein at least one of the one or more policies is dependent on a network state.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 1, wherein at least one of the one or more policies is dependent on a network state." *See*, for example, the disclosures identified for claim 1. As a further example, the Accused Instrumentalities comprise policies which are dependent on network states (e.g. congestion, and/or roaming). *See, e.g.*: Where the network is lightly loaded in relation to available capacity, a customer whose data is prioritized higher than other traffic will notice little, if any, effect from having higher priority. This will be the case in the vast majority of times and locations. Customers may notice reduced speeds in comparison to customers with a higher priority during network congestion. At times and at locations where the network is heavily loaded in relation to available capacity, these customers will likely see significant reductions in data speeds, especially if they are engaged in data-intensive activities. Customers should be aware that these practices may occasionally result in speeds below those typically experienced on our 5G or LTE networks, including a greater likelihood of reduced speeds in the lower end of the speed ranges. Depending on the extent of network congestion, these customers may notice more frequent impacts to some video streaming, file downloads, and other high-bandwidth activities. T-Mobile constantly works to improve network performance and capacity, but there are physical and technical limits on how much capacity is available, and in constrained locations the frequency of heavy loading in relation to available capacity may be greater than in other locations. When network loading goes down or the customer moves to a location that is less heavily loaded in relation to available capacity, the customer's speeds will likely improve. https://www.t-mobile.com/responsibility/consumer-info/policies/internet-service

	CAN I ROAM ON MY DEVICE? ***Domestic Roaming.*** Your Device may connect to another provider's network ("Off-Net"). This may happen even when you are within the T-Mobile coverage area. Check your Device to determine if you are Off-Net. Please do not abuse this; we may limit or terminate your Service if you do. Your device may also connect to another provider's secured Wi-Fi network. See **WHAT ARE THE PERMITTED AND PROHIBITED USES FOR MY DEVICE AND SERVICE?** section for additional info. https://www.t-mobile.com/responsibility/legal/terms-and-conditions
9. The network service plan provisioning system of claim 8, wherein the network state comprises a congestion state of the wireless access network, a network location, a type of the wireless access network, whether the wireless access network is a roaming network, a routing identifier associated with the wireless access network, or a combination of these.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 8, wherein the network state comprises a congestion state of the wireless access network, a network location, a type of the wireless access network, whether the wireless access network is a roaming network, a routing identifier associated with the wireless access network, or a combination of these." *See*, for example, the disclosures identified for claims 1 and 8. As a further example, the Accused Instrumentalities comprise network states, e.g. congestion state, network location, roaming, and/or routing identifiers. *See, e.g.*: Where the network is lightly loaded in relation to available capacity, a customer whose data is prioritized higher than other traffic will notice little, if any, effect from having higher priority. This will be the case in the vast majority of times and locations. Customers may notice reduced speeds in comparison to customers with a higher priority during network congestion. At times and at locations where the network is heavily loaded in relation to available capacity, these customers will likely see significant reductions in data speeds, especially if they are engaged in data-intensive activities. Customers should be aware that these practices may occasionally result in speeds below those typically experienced on our 5G or LTE networks, including a greater likelihood of reduced speeds in the lower end of the speed ranges. Depending on the extent of network congestion, these customers may notice more frequent impacts to some video streaming, file downloads, and other high-bandwidth activities. T-Mobile constantly works to improve network performance and capacity, but there are physical and technical limits on how much capacity is available, and in constrained locations the frequency of heavy loading in relation to available capacity may be greater than in other locations. When network loading goes down or the customer moves to a location that is less heavily loaded in relation to available capacity, the customer's speeds will likely improve. https://www.t-mobile.com/responsibility/consumer-info/policies/internet-service

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10. The network service plan provisioning system of claim 9, wherein the congestion state is based on a time of day, a measure of network congestion, a measure of a delay, a measure of a jitter, a packet error rate, or a combination of these.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 9, wherein the congestion state is based on a time of day, a measure of network congestion, a measure of a delay, a measure of a jitter, a packet error rate, or a combination of these." *See*, for example, the disclosures identified for claims 1, and 8-9.
11. The network service plan provisioning system of claim 5, wherein the one or more network elements are further configured to provide a user interface for a service plan design environment that provides for entering the policy enforcement priority rule in the design environment by entering a priority assignment for the first service plan component, entering a priority assignment for the second service plan component, positioning the first and second service plan components in a priority ordering, defining the first or second service plan component as belonging to a service type that has an implied or literal ordering, or a combination of these.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 5, wherein the one or more network elements are further configured to provide a user interface for a service plan design environment that provides for entering the policy enforcement priority rule in the design environment by entering a priority assignment for the first service plan component, entering a priority assignment for the second service plan component, positioning the first and second service plan components in a priority ordering, defining the first or second service plan component as belonging to a service type that has an implied or literal ordering, or a combination of these." *See*, for example, the disclosures identified for claims 1, and 8-9. On information and belief, the Accused Instrumentalities are configured to provide a user interface for a service plan design environment that provides for entering the policy enforcement priority rule in the design environment by entering a priority assignment for service plan components, ordering, and/or grouping to define filters and logic to implement those rules on traffic as shown by the exemplary citations in claims 1 and 8-9 above.

12. The network service plan provisioning system of claim 1, wherein the information specifying the first traffic classification filter comprises an inspection criterion selected from a group of inspection criteria consisting of: specific device application, a specific network destination, a specific network source, a specific traffic type, a specific content type, a specific traffic protocol, and a combination of two or more of the inspection criteria.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 1, wherein the information specifying the first traffic classification filter comprises an inspection criterion selected from a group of inspection criteria consisting of: specific device application, a specific network destination, a specific network source, a specific traffic type, a specific content type, a specific traffic protocol, and a combination of two or more of the inspection criteria." *See*, for example, the disclosures identified for claims 1, and 8-9. As a further example, the information specifying traffic classification filters comprises inspection criterion such as plan level, plan type, plan feature, and/or plan option (e.g., Personal or Business, Essentials, Go5G, Go5G Plus, Go5G Next, Postpaid, Prepaid, Mobile Hotspot, Data Pass, HD streaming, Binge On, etc.), as well as subscriber type (e.g., first responder, business, enterprise, personal, MVNO, etc.), usage type (voice, video, gaming, messaging, etc.), usage level (e.g., heavy data users), content type (video, messaging, voice, etc.).
13. The network service plan provisioning system of claim 1, wherein the first or second policy enforcement action is an action selected from a group of actions consisting of: apply a traffic control policy; apply a service usage accounting, charging, or billing policy; apply a service notification policy; and a combination of two or more of the actions.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 1, wherein the first or second policy enforcement action is an action selected from a group of actions consisting of: apply a traffic control policy; apply a service usage accounting, charging, or billing policy; apply a service notification policy; and a combination of two or more of the actions." *See*, for example, the disclosures identified for claims 1, and 8-9. As a further example, the policy enforcement actions such as reducing data speeds, account for/bill for additional data and account features, notify users regarding their usage, etc.
15. The network service plan provisioning system of claim 1, wherein the one or more network elements are further configured to include in the network provisioning instruction set an instruction to assist in enforcing a classification-based charging policy, wherein the classification is selected	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 1, wherein the one or more network elements are further configured to include in the network provisioning instruction set an instruction to assist in enforcing a classification-based charging policy, wherein the classification is selected from the group of classification categories consisting of: application, destination, network, time of day, congestion state, quality of service, content type, and a combination of two or more of the classification categories." *See*, for example, the disclosures identified for claims 1, 8-9, and 15.

from the group of classification categories consisting of: application, destination, network, time of day, congestion state, quality of service, content type, and a combination of two or more of the classification categories.	
16. The network service plan provisioning system of claim 1, wherein the one or more network elements are further configured to include in the network provisioning instruction set an instruction to assist in presenting a service buy page notification with an actionable response.	The Accused Instrumentalities comprise "the one or more network elements are further configured to include in the network provisioning instruction set an instruction to assist in presenting a service buy page notification with an actionable response." *See, e.g.*: **Resetting the modem based on PCO values** Based on PCO values received from the network, the modem will be reset in the following scenarios: • The user completed self-activation after receiving PCO = 5 from the network. A new PCO value (3, 0 or anything Mobile Operator App can recognize) will be sent to the OS and the OS will pass it to Mobile Operator App. • The user added more credit to their account after receiving PCO = 3. A new PCO value (0, or anything Mobile Operator App can recognize) will be sent to the OS and the OS will pass it to Mobile Operator App. The host is not aware of the modem being reset, so the activated connections from the host will not be deactivated and the modem should automatically re-establish connection with those PDN after resetting. Upon establishing connection and receiving a new incoming PCO value from the network, the modem will provide an unsolicited NDIS_STATUS_WWAN_PCO_STATUS notification to the host. The following diagram illustrates the modem's reset flow when one of these scenarios occurs, with Verizon Wireless as the example MO:

	https://learn.microsoft.com/en-us/windows-hardware/drivers/network/mb-protocol-configuration-options-pco-operations
21. The network service plan provisioning system of claim 1, wherein the one or more network elements are further configured to facilitate reuse of the first service plan component, the second service plan component, the first traffic classification filter, the second traffic classification filter, the first policy enforcement action, or the second policy enforcement action in a plurality of service plans by storing the first service plan component, the second service plan component, the first traffic classification filter, the second traffic classification filter, the first policy enforcement action, and the second policy enforcement action as one or more objects in a catalog.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 1, wherein the one or more network elements are further configured to facilitate reuse of the first service plan component, the second service plan component, the first traffic classification filter, the second traffic classification filter, the first policy enforcement action, or the second policy enforcement action in a plurality of service plans by storing the first service plan component, the second service plan component, the first traffic classification filter, the second traffic classification filter, the first policy enforcement action, and the second policy enforcement action as one or more objects in a catalog." *See*, for example, the disclosures identified for claims 1, 8-9, and 15.
22. The network service plan provisioning system of claim 1, wherein the first service plan component further comprises an additional policy enforcement action to augment the first policy enforcement action, and wherein the second service plan component further comprises the additional policy enforcement action to augment the second policy enforcement action.	The Accused Instrumentalities comprise "the first service plan component further comprises an additional policy enforcement action to augment the first policy enforcement action, and wherein the second service plan component further comprises the additional policy enforcement action to augment the second policy enforcement action." For example, the service plan components comprise an additional policy enforcement action that throttles data when high-speed data usage for the service period exceeds the limit under the subscription plan whether the traffic event possesses a characteristic that matches the first or second traffic classification filter. *See* claim 1.
23. The network service plan provisioning system of claim 1, wherein the first service plan component further comprises an additional policy enforcement action to over-ride the first	The Accused Instrumentalities comprise "the first service plan component further comprises an additional policy enforcement action to over-ride the first policy enforcement action, and wherein the second service plan component further comprises the additional policy enforcement action to over-ride the second policy enforcement action." For example, the service plan components comprise an additional policy enforcement action that throttles data when high-

policy enforcement action, and wherein the second service plan component further comprises the additional policy enforcement action to over-ride the second policy enforcement action.	speed data usage for the service period exceeds the limit under the subscription plan whether the traffic event possesses a characteristic that matches the first or second traffic classification filter. *See* claim 1.
28. The network service plan provisioning system of claim 1, wherein the one or more network elements are further configured to obtain service plan parameters for multiple service plans, combine one or more service policies for the multiple service plans into one composite-plan policy set, and provision the network policy enforcement system to enforce the composite policies for the multiple service plans.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 1, wherein the one or more network elements are further configured to obtain service plan parameters for multiple service plans, combine one or more service policies for the multiple service plans into one composite-plan policy set, and provision the network policy enforcement system to enforce the composite policies for the multiple service plans." *See*, for example, the disclosures identified for claims 1, 8-9, and 15.
30. The network service plan provisioning system of claim 1, wherein the first service plan component is associated with a first priority, and wherein the second service plan component is associated with a second priority, the second priority being lower than the first priority, and wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises include in the network provisioning instruction set one or more first instructions directing the network traffic inspection system to determine whether the traffic event possesses the	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 1, wherein the first service plan component is associated with a first priority, and wherein the second service plan component is associated with a second priority, the second priority being lower than the first priority, and wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises include in the network provisioning instruction set one or more first instructions directing the network traffic inspection system to determine whether the traffic event possesses the characteristic that matches the first traffic classification filter and to determine whether the traffic event possesses the characteristic that matches the second traffic classification filter, and one or more second instructions directing the network policy enforcement system to enforce the first network policy enforcement action when the traffic event possesses both the characteristic that matches the first traffic classification filter and the characteristic that matches the second traffic classification filter." *See*, for example, the disclosures identified for claims 1, 8-9, and 15.

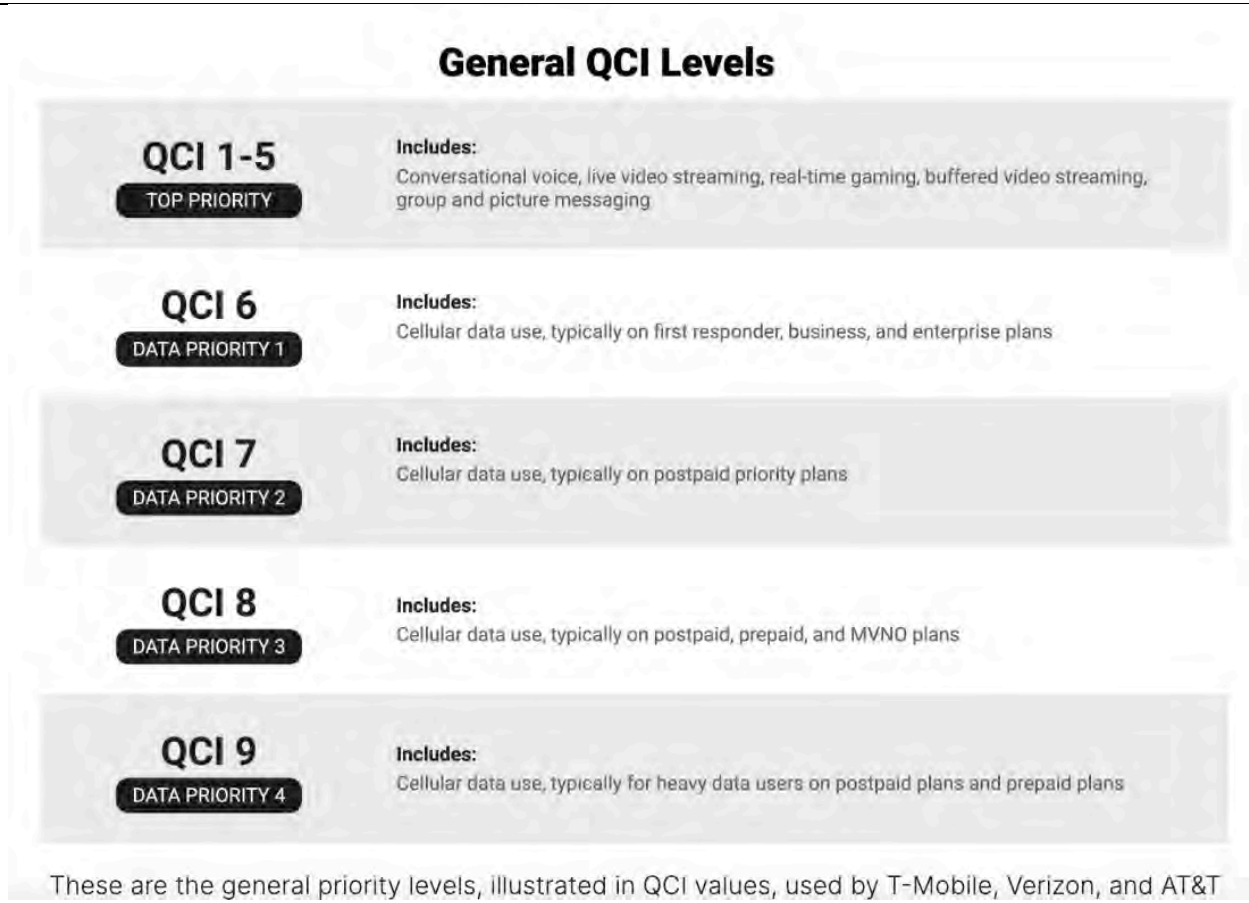
characteristic that matches the first traffic classification filter and to determine whether the traffic event possesses the characteristic that matches the second traffic classification filter, and one or more second instructions directing the network policy enforcement system to enforce the first network policy enforcement action when the traffic event possesses both the characteristic that matches the first traffic classification filter and the characteristic that matches the second traffic classification filter.	
31. The network service plan provisioning system of claim 1, wherein the first service plan component is associated with a first priority, and wherein the second service plan component is associated with a second priority, the second priority being lower than the first priority, and wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises include in the network provisioning instruction set one or more first instructions directing the network traffic inspection system to determine whether the traffic event possesses the characteristic that matches the first traffic classification filter, and one or more second instructions directing the network	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 1, wherein the first service plan component is associated with a first priority, and wherein the second service plan component is associated with a second priority, the second priority being lower than the first priority, and wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises include in the network provisioning instruction set one or more first instructions directing the network traffic inspection system to determine whether the traffic event possesses the characteristic that matches the first traffic classification filter, and one or more second instructions directing the network policy enforcement system to enforce only the first network policy enforcement action when the traffic event possesses the characteristic that matches the first traffic classification filter." *See*, for example, the disclosures identified for claims 1, 8-9, and 15.

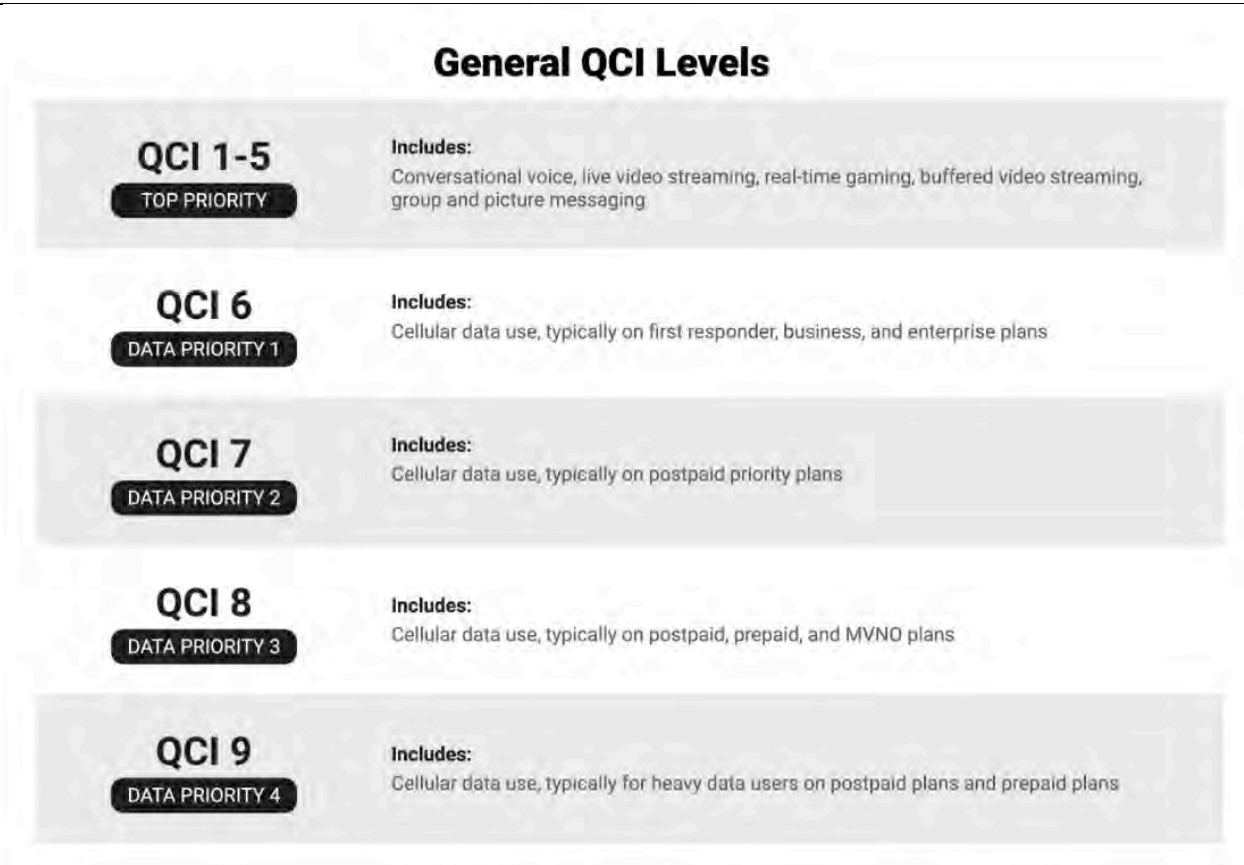
policy enforcement system to enforce only the first network policy enforcement action when the traffic event possesses the characteristic that matches the first traffic classification filter.	
32. The network service plan provisioning system of claim 1, wherein the first service plan component is associated with a first priority, and wherein the second service plan component is associated with a second priority, the second priority being lower than the first priority, and wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises include in the network provisioning instruction set one or more first instructions directing the network traffic inspection system to determine whether the traffic event possesses the characteristic that matches the first traffic classification filter and to determine whether the traffic event possesses the characteristic that matches the second traffic classification filter, and one or more second instructions directing the network policy enforcement system to enforce the first network policy enforcement action and the second network policy enforcement action when the traffic event possesses both the	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 1, wherein the first service plan component is associated with a first priority, and wherein the second service plan component is associated with a second priority, the second priority being lower than the first priority, and wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises include in the network provisioning instruction set one or more first instructions directing the network traffic inspection system to determine whether the traffic event possesses the characteristic that matches the first traffic classification filter and to determine whether the traffic event possesses the characteristic that matches the second traffic classification filter, and one or more second instructions directing the network policy enforcement system to enforce the first network policy enforcement action and the second network policy enforcement action when the traffic event possesses both the characteristic that matches the first traffic classification filter and the characteristic that matches the second traffic classification filter." *See*, for example, the disclosures identified for claims 1, 8-9, and 15.

characteristic that matches the first traffic classification filter and the characteristic that matches the second traffic classification filter.	
33. The network service plan provisioning system of claim 1, wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises order one or more first instructions associated with the first traffic classification filter and one or more second instructions associated with the second traffic classification filter so that the first traffic classification filter is applied to the traffic event before the second traffic classification filter is applied to the traffic event.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 1, wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises order one or more first instructions associated with the first traffic classification filter and one or more second instructions associated with the second traffic classification filter so that the first traffic classification filter is applied to the traffic event before the second traffic classification filter is applied to the traffic event." *See*, for example, the disclosures identified for claims 1, 8-9, and 15.
35. The network service plan provisioning system of claim 1, wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises apply an explicit priority rule.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 1, wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises apply an explicit priority rule." *See*, for example, the disclosures identified for claims 1, 8-9, and 15.
36. The network service plan provisioning system of claim 1, wherein process the first service plan component and the second service plan component to create a network provisioning instruction	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 1, wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises configure the one or more traffic inspection provisioning instructions so that the network traffic

set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises configure the one or more traffic inspection provisioning instructions so that the network traffic inspection system determines whether the traffic event possesses the characteristic that matches the first traffic classification filter before determining whether the traffic event possesses the characteristic that matches the second traffic classification filter.	inspection system determines whether the traffic event possesses the characteristic that matches the first traffic classification filter before determining whether the traffic event possesses the characteristic that matches the second traffic classification filter." *See*, for example, the disclosures identified for claims 1, 8-9, and 15.
37. The network service plan provisioning system of claim 1, wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises configure the one or more policy enforcement provisioning instructions so that the network policy enforcement system applies the first policy enforcement action before applying the second policy enforcement action.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 1, wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises configure the one or more policy enforcement provisioning instructions so that the network policy enforcement system applies the first policy enforcement action before applying the second policy enforcement action." *See*, for example, the disclosures identified for claims 1, 8-9, and 15.
38. The network service plan provisioning system of claim 1, wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over	The Accused Instrumentalities comprise "process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises configure the one or more traffic inspection provisioning instructions so that when the traffic event possesses the characteristic that matches the first traffic classification filter, the network policy enforcement system applies the first policy enforcement action, and the

the second traffic classification filter comprises configure the one or more traffic inspection provisioning instructions so that when the traffic event possesses the characteristic that matches the first traffic classification filter, the network policy enforcement system applies the first policy enforcement action, and the network traffic inspection system does not determine whether the traffic event possesses the characteristic that matches the second traffic classification filter.	network traffic inspection system does not determine whether the traffic event possesses the characteristic that matches the second traffic classification filter." *See, e.g.*, claim 3.
39. The network service plan provisioning system of claim 1, wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises configure the network provisioning instruction set so that when the traffic event possesses the characteristic that matches the first traffic classification filter and the characteristic that matches the second traffic classification filter, the first policy enforcement action has a higher priority than the second policy enforcement action.	The Accused Instrumentalities comprise "process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises configure the network provisioning instruction set so that when the traffic event possesses the characteristic that matches the first traffic classification filter and the characteristic that matches the second traffic classification filter, the first policy enforcement action has a higher priority than the second policy enforcement action." *See, e.g.*:

	 https://www.bestphoneplans.net/news/data-priority
40. The network service plan provisioning system of claim 1, wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises configure the one or more	The Accused Instrumentalities comprise "process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises configure the one or more traffic inspection provisioning instructions so that when the network traffic inspection system determines that the traffic event possesses the characteristic that matches the first traffic classification filter and the characteristic that matches the second traffic classification filter, the network policy enforcement system applies the first policy enforcement action but does not apply the second policy enforcement action." *See, e.g.*:

traffic inspection provisioning instructions so that when the network traffic inspection system determines that the traffic event possesses the characteristic that matches the first traffic classification filter and the characteristic that matches the second traffic classification filter, the network policy enforcement system applies the first policy enforcement action but does not apply the second policy enforcement action.	 These are the general priority levels, illustrated in QCI values, used by T-Mobile, Verizon, and AT&T https://www.bestphoneplans.net/news/data-priority
41. The network service plan provisioning system of claim 1, wherein process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises configure the one or more	The Accused Instrumentalities comprise “process the first service plan component and the second service plan component to create a network provisioning instruction set in accordance with a prioritization of the first traffic classification filter over the second traffic classification filter comprises configure the one or more traffic inspection provisioning instructions so that when the network traffic inspection system determines that the traffic event possesses the characteristic that matches the first traffic classification filter and the characteristic that matches the second traffic classification filter, the network policy enforcement system applies the first policy enforcement action before applying the second policy enforcement action.” For example, the service plan components comprise a first policy enforcement action that prioritizes the traffic

traffic inspection provisioning instructions so that when the network traffic inspection system determines that the traffic event possesses the characteristic that matches the first traffic classification filter and the characteristic that matches the second traffic classification filter, the network policy enforcement system applies the first policy enforcement action before applying the second policy enforcement action.	event (e.g., video streaming) and a second policy enforcement action that throttles data, when the network traffic inspection system determines that the traffic event (e.g., video streaming) possesses the characteristic that matches the first traffic classification filter and the characteristic that matches the second traffic classification filter, and high-speed data usage for the service period exceeds the limit under the subscription plan. *See* claim 1.
42. The network service plan provisioning system of claim 1, wherein the network policy enforcement system comprises a policy decision element.	The Accused Instrumentalities comprise "the network policy enforcement system comprises a policy decision element." For example, T-Mobile's system comprises a policy decision element that determines which service plan components to implement for a particular device based on the subscription plan associated with that device. *See* claim 1.
43. The network service plan provisioning system of claim 1, wherein the network policy enforcement system or the network traffic inspection system comprises a gateway.	The Accused Instrumentalities comprise "the network policy enforcement system or the network traffic inspection system comprises a gateway." On information and belief, the gateway applies the network policy enforcement actions to traffic events before such traffic uses additional network resources.
44. The network service plan provisioning system of claim 1, wherein at least a portion of the network policy enforcement system is on the wireless end-user device.	The Accused Instrumentalities comprise "wherein at least a portion of the network policy enforcement system is on the wireless end-user device." *See* claim 1.
45. The network service plan provisioning system of claim 1, wherein at least a portion of the network policy enforcement system is in a network system communicatively coupled to the wireless end-user device over the wireless access network.	The Accused Instrumentalities comprise "at least a portion of the network policy enforcement system is in a network system communicatively coupled to the wireless end-user device over the wireless access network." *See* claim 1.
46. The network service plan provisioning system of claim 1, wherein	The Accused Instrumentalities comprise "the network traffic inspection system or the network policy enforcement system comprises a programmable element." *See* claims 1, 44.

the network traffic inspection system or the network policy enforcement system comprises a programmable element.	
47. The network service plan provisioning system of claim 1, wherein the network policy enforcement system or the network traffic inspection system comprises a modem or an agent on the wireless end-user device.	The Accused Instrumentalities comprise "the network policy enforcement system or the network traffic inspection system comprises a modem or an agent on the wireless end-user device." *See* claims 1, 44.
57. The network service plan provisioning system of claim 1, wherein the network policy enforcement system comprises a notification element.	The Accused Instrumentalities comprise "the network policy enforcement system comprises a notification element." On information and belief, a notification element implements a notification function that sends a message to the wireless end-user device indicating that data usage has reached a limit for the service period under the subscription plan which causes the device to display a notification to inform the user and prompt the user to purchase additional data or an upgraded plan. *See* claim 1.

	Resetting the modem based on PCO values Based on PCO values received from the network, the modem will be reset in the following scenarios: • The user completed self-activation after receiving PCO = 5 from the network. A new PCO value (3, 0 or anything Mobile Operator App can recognize) will be sent to the OS and the OS will pass it to Mobile Operator App. • The user added more credit to their account after receiving PCO = 3. A new PCO value (0, or anything Mobile Operator App can recognize) will be sent to the OS and the OS will pass it to Mobile Operator App. The host is not aware of the modem being reset, so the activated connections from the host will not be deactivated and the modem should automatically re-establish connection with those PDN after resetting. Upon establishing connection and receiving a new incoming PCO value from the network, the modem will provide an unsolicited NDIS_STATUS_WWAN_PCO_STATUS notification to the host. The following diagram illustrates the modem's reset flow when one of these scenarios occurs, with Verizon Wireless as the example MO: https://learn.microsoft.com/en-us/windows-hardware/drivers/network/mb-protocol-configuration-options-pco-operations
58. The network service plan provisioning system of claim 1, wherein the network policy enforcement system implements a notification function.	The Accused Instrumentalities comprise "the network policy enforcement system implements a notification function." *See* claim 57.
59. The network service plan provisioning system of claim 58, wherein the one or more network elements are further configured to: obtain notification	The Accused Instrumentalities comprise "the one or more network elements are further configured to: obtain notification information, the notification information at least assisting to specify or identify a notification content, a notification trigger, or a notification offer; and

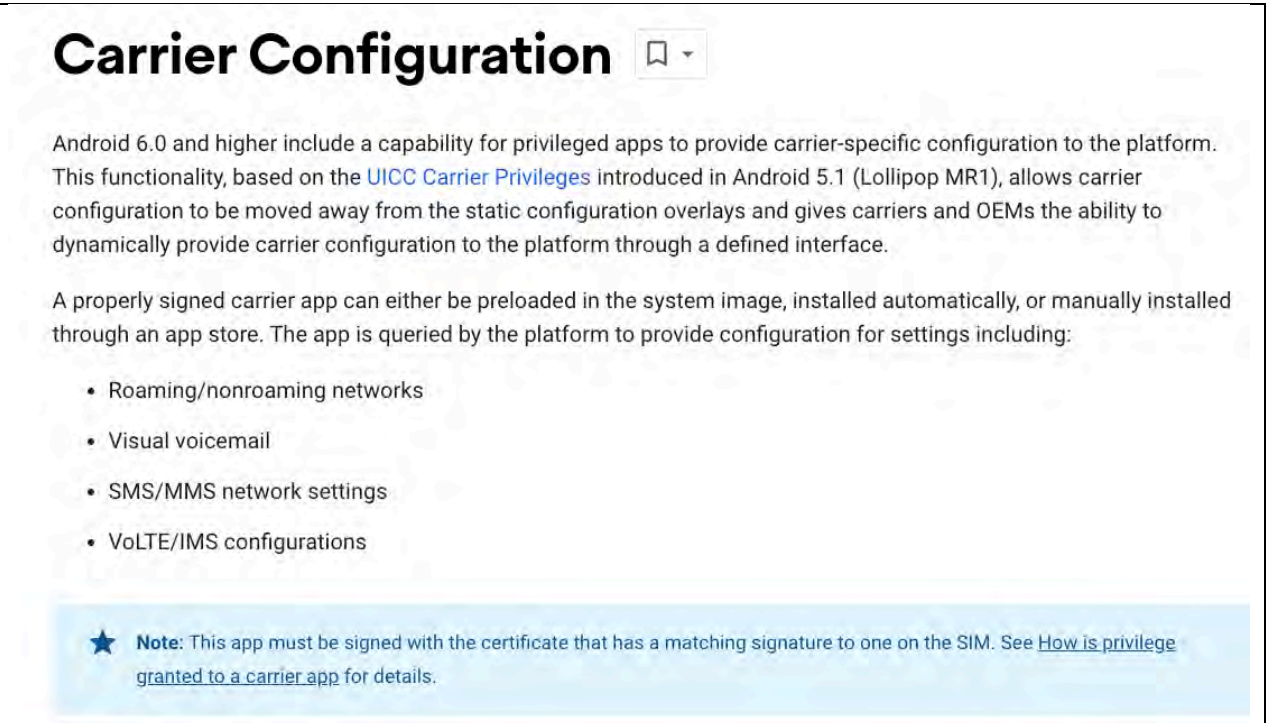
information, the notification information at least assisting to specify or identify a notification content, a notification trigger, or a notification offer; and determine at least a portion of the policy enforcement provisioning instructions based on the notification information.	determine at least a portion of the policy enforcement provisioning instructions based on the notification information." On information and belief, the Accused Instrumentalities obtain notification information when the user purchases purchase additional data or an upgraded plan (e.g., a data add on through the T-Mobile app), which assists to identify the notification offer that resulted in the purchase, and determines at least a portion of the policy enforcement provisioning instructions (e.g., a data limit) based on the notification information.
60. The network service plan provisioning system of claim 1, wherein the one or more policies comprise a notification policy.	The Accused Instrumentalities comprise "the one or more policies comprise a notification policy." *See* claims 57-59.
61. The network service plan provisioning system of claim 60, wherein the one or more policy enforcement provisioning instructions assist in causing a notification to be delivered to a subscriber or to the wireless end-user device.	The Accused Instrumentalities comprise "the one or more policy enforcement provisioning instructions assist in causing a notification to be delivered to a subscriber or to the wireless end-user device." *See* claims 57-59.
62. The network service plan provisioning system of claim 61, wherein the notification comprises a selection option for providing feedback or instructions.	The Accused Instrumentalities comprise "the notification comprises a selection option for providing feedback or instructions." *See, e.g.*: Keeping things simple yet secure – the T-Mobile app allows you to do it all in one place : · Try the T-Mobile network with Network Pass · Switch to T-Mobile in minutes with Easy Switch · Compare network performance with Network Scorecard · Manage your account, add and remove services, and change plans · Pay bills, set-up autopay, and payment plan options... https://play.google.com/store/apps/details?id=com.tmobile.pr.mytmobile&hl=en_US&pli=1

	Keeping things simple yet secure – the T-Mobile app allows you to do it all in one place · Try the T-Mobile network with Network Pass · Switch to T-Mobile in minutes with Easy Switch · Compare network performance with Network Scorecard · Manage your account, add and remove services, and change plans · Pay bills, set-up autopay, and payment plan options · Shop devices and view offers · Manage international data · Profile settings Don't forget to enroll in bio authentication in your phone settings to easily authenticate while on the go! https://apps.apple.com/us/app/t-mobile/id561625752 **Manage Marketing Communication Preferences** Decide how you want to receive information regarding T-Mobile products and services. • Update your registered marketing email address preferences. • Updating the email address may not stop all communications to the previously registered address. We recommend opting out prior to updating your email address. • Lines are limited to having one email address on file at a time. • Select the T-Mobile product you use to manage email, SMS or calling preferences for general T-Mobile updates, wireless, tablets & wearables, Internet, TV, banking, and more! • As a T-Mobile customer, you can also choose to opt out of all current and future marketing communications. **Manage notifications** • By default, T-Mobile will always send notifications when you are approaching the talk, text, or data limits on your own line. • Primary account holders can set notification preferences when other lines on the account are approaching usage limits. https://www.t-mobile.com/support/account/manage-privacy-and-notifications
63. The network service plan provisioning system of claim 61, wherein the notification indicates that a usage of a service plan has reached a particular percentage of a limit, or that a requested network activity has been capped because a policy limit has been reached.	The Accused Instrumentalities comprise "the notification indicates that a usage of a service plan has reached a particular percentage of a limit, or that a requested network activity has been capped because a policy limit has been reached." *See* claims 57-59.
64. The network service plan provisioning system of claim 61, wherein	The Accused Instrumentalities comprise "the notification provides information about a service plan limit or an overage." *See* claims 57-59.

the notification provides information about a service plan limit or an overage.	
65. The network service plan provisioning system of claim 61, wherein the notification provides information about an offer.	The Accused Instrumentalities comprise "the notification provides information about an offer." *See* claims 57-59.
66. The network service plan provisioning system of claim 65, wherein the offer is an offer to allow an overage, an offer for a new service plan, or an offer to block an ongoing usage.	The Accused Instrumentalities comprise "the offer is an offer to allow an overage, an offer for a new service plan, or an offer to block an ongoing usage." *See* claims 57-59.
68. The network service plan provisioning system of claim 61, wherein the notification provides information about an activity of the wireless end-user device that has been blocked, or an activity of the wireless end-user device that is not allowed.	The Accused Instrumentalities comprise "the notification provides information about an activity of the wireless end-user device that has been blocked, or an activity of the wireless end-user device that is not allowed." *See* claims 57-59.
69. The network service plan provisioning system of claim 61, wherein the notification provides a message or an offer based on a current activity or a status of the wireless end-user device.	The Accused Instrumentalities comprise "the notification provides a message or an offer based on a current activity or a status of the wireless end-user device." *See* claims 57-59.
70. The network service plan provisioning system of claim 69, wherein the current activity or the status of the wireless end-user device is based on the traffic event.	The Accused Instrumentalities comprise "the current activity or the status of the wireless end-user device is based on the traffic event." *See* claims 57-59.
71. The network service plan provisioning system of claim 61, wherein the notification is an actionable notification enabling a user of the wireless end-user device to provide a response to the notification.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 61, wherein the notification is an actionable notification enabling a user of the wireless end-user device to provide a response to the notification." *See* claims 57-59.

72. The network service plan provisioning system of claim 71, wherein the response comprises a directive to dismiss the notification, a directive to cancel the notification, an acknowledgment of the notification, a request for information, or a request to make a purchase.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 71, wherein the response comprises a directive to dismiss the notification, a directive to cancel the notification, an acknowledgment of the notification, a request for information, or a request to make a purchase." *See* claims 57-59.
80. The network service plan provisioning system of claim 61, wherein the notification comprises an upsell offer.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 61, wherein the notification comprises an upsell offer." *See* claims 57-59.
85. The network service plan provisioning system of claim 61, wherein the notification comprises information about a purchase, a data usage, an application, an amount of data, a percentage, or a combination of these.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 61, wherein the notification comprises information about a purchase, a data usage, an application, an amount of data, a percentage, or a combination of these." *See* claims 57-59.
86. The network service plan provisioning system of claim 61, wherein the notification comprises information to assist a subscriber in activating the wireless end-user device, selecting a service plan for the wireless end-user device, setting a preference, or a combination of these.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 61, wherein the notification comprises information to assist a subscriber in activating the wireless end-user device, selecting a service plan for the wireless end-user device, setting a preference, or a combination of these." *See* claims 57-59.
87. The network service plan provisioning system of claim 1, wherein the one or more policies comprise a traffic control policy.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 1, wherein the one or more policies comprise a traffic control policy." *See* claim 1.
88. The network service plan provisioning system of claim 87, wherein the control policy specifies to allow, block, throttle, delay, or defer the traffic event.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 87, wherein the control policy specifies to allow, block, throttle, delay, or defer the traffic event." *See* claim 1.

89. The network service plan provisioning system of claim 87, wherein the traffic control policy is based on a network state, a device state, a service-plan-usage state, or a combination of these.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 87, wherein the traffic control policy is based on a network state, a device state, a service-plan-usage state, or a combination of these." *See* claim 1.
90. The network service plan provisioning system of claim 1, wherein the traffic event is associated with a particular destination, a particular application on the wireless end-user device, a content type, a protocol, a port, or an operating system of the wireless end-user device.	The Accused Instrumentalities comprise "the traffic event is associated with a particular destination, a particular application on the wireless end-user device, a content type, a protocol, a port, or an operating system of the wireless end-user device." *See* claim 1.
91. The network service plan provisioning system of claim 1, wherein the traffic event is associated with a specified remote destination, a specified application, a specified operating system, a specified content, a specified protocol, or a specified port number.	The Accused Instrumentalities comprise "the traffic event is associated with a specified remote destination, a specified application, a specified operating system, a specified content, a specified protocol, or a specified port number." *See* claim 1.
92. The network service plan provisioning system of claim 91, wherein the specified remote destination is identified by a domain or an Internet protocol (IP) address.	The Accused Instrumentalities comprise "the specified remote destination is identified by a domain or an Internet protocol (IP) address." *See* claims 1, 91.
93. The network service plan provisioning system of claim 91, wherein the specified application is identified by a name, a hash, a certificate, or a signature.	The Accused Instrumentalities comprise "the specified application is identified by a name, a hash, a certificate, or a signature." *See, e.g.*:

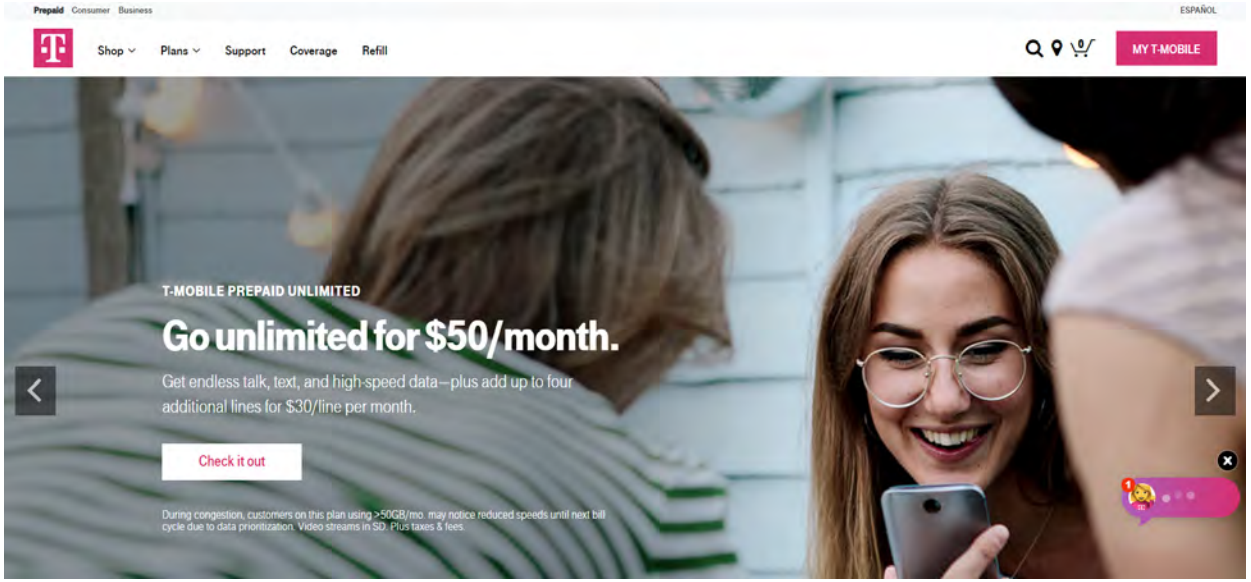
	 https://source.android.com/docs/core/connect/carrier
96. The network service plan provisioning system of claim 1, wherein the first service plan component or the second service plan component comprises a carrier component, a network protection component, an application component, a sponsored component, a subscriber-paid component, a marketing interceptor component, a parental control component, a bulk component, a post-bulk component, or an end-of-life component.	The Accused Instrumentalities comprise "the first service plan component or the second service plan component comprises a carrier component, a network protection component, [or] an application component." *See* claim 1.
98. The network service plan provisioning system of claim 1, wherein	The Accused Instrumentalities comprise "the first service plan component or the second service plan component is associated with a service class." *See* claim 1.

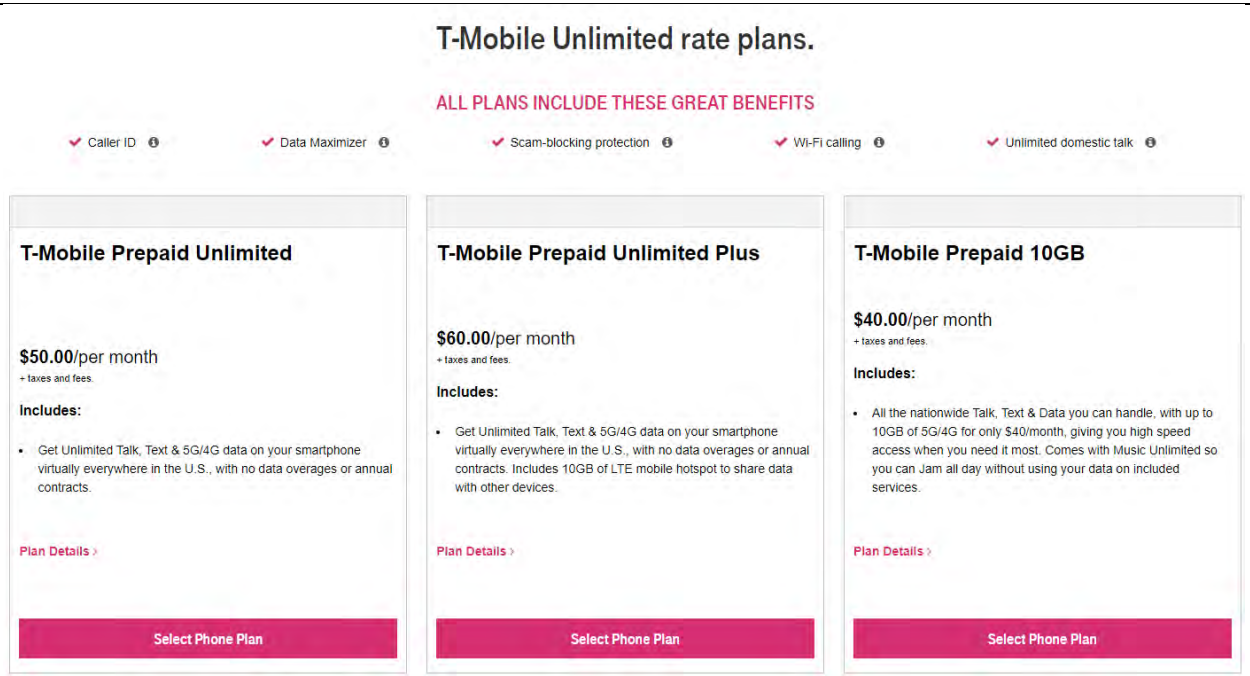
the first service plan component or the second service plan component is associated with a service class.	
99. The network service plan provisioning system of claim 98, wherein the service class is paid, marketing intercept, carrier, network protection, sponsored, parental control, open access, bulk, post-bulk, or a combination of these.	The Accused Instrumentalities comprise "the service class is paid … carrier, network protection … open access … or a combination of these." *See* claims 1, 96, 98.
112. The network service plan provisioning system of claim 1, wherein the information specifying the first traffic classification filter or the information specifying the second traffic classification filter comprises a name, a description, a filtering parameter, a launch mechanism, or a combination of these.	The Accused Instrumentalities comprise "the information specifying the first traffic classification filter or the information specifying the second traffic classification filter comprises a name, a description, a filtering parameter, a launch mechanism, or a combination of these." *See* claim 1.
113. The network service plan provisioning system of claim 112, wherein the filter parameter specifies filtering the traffic event by destination, by application, by operating system, by protocol, or by port.	The Accused Instrumentalities comprise "the filter parameter specifies filtering the traffic event by destination, by application, by operating system, by protocol, or by port." *See* claim 1.
120. The network service plan provisioning system of claim 1, wherein the one or more policies comprise a policy associated with a tethering function.	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 1, wherein the one or more policies comprise a policy associated with a tethering function." *See*, for example, the disclosures identified for claims 1, 8-9, and 15.
121. The network service plan provisioning system of claim 1, wherein the one or more policies comprise a	The Accused Instrumentalities comprise "[t]he network service plan provisioning system of claim 1, wherein the one or more policies comprise a policy associated with a web page, a

policy associated with a web page, a domain, an application, a roaming network, an e-mail service, a networking service, a music download service, a video game service, a multimedia service, or a combination of these.	domain, an application, a roaming network, an e-mail service, a networking service, a music download service, a video game service, a multimedia service, or a combination of these." *See*, for example, the disclosures identified for claims 1, 8-9, and 15.

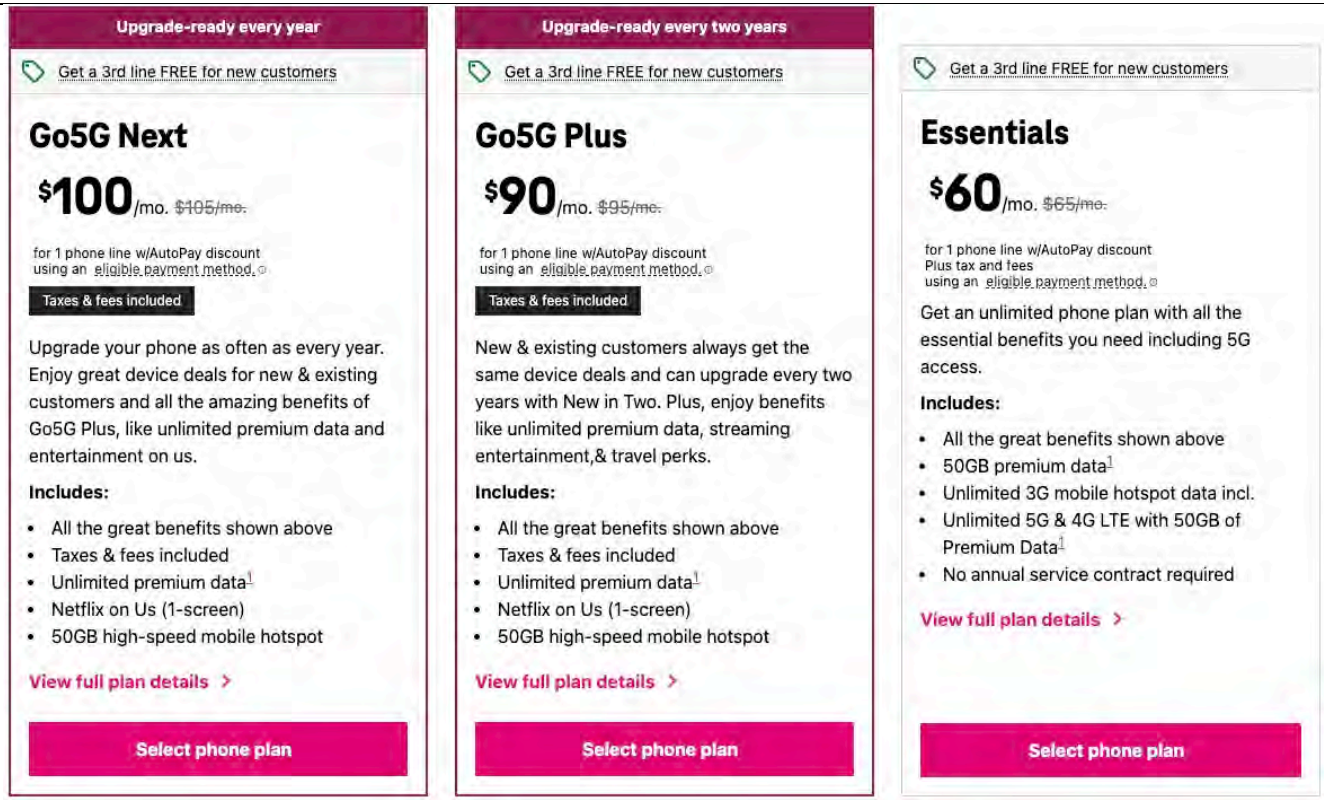
Exhibit 4 - U.S. Patent No. 9,198,042 ("'042 Patent")

Accused Instrumentalities: smartphones, basic phones, tablets, laptops, and hotspot devices sold (including those sold in bundles with data plans) or used by T-Mobile for use with T-Mobile's wireless network services, and all versions and variations thereof since the issuance of the asserted patent.

Issued Claim(s)	Public Documentation
1. A method comprising:	To the extent the preamble is limiting, T-Mobile's Accused Instrumentalities practice the steps of a method as set forth in the limitations below.
1[a] receiving, over a service control link, a report from a wireless end-user device, the report comprising information about a device service state;	The Accused Instrumentalities comprise receiving, over a service control link, a report from a wireless end-user device, the report comprising information about a device service state. T-Mobile offers telecommunications service plans to customers that are provided through various network elements such as telecommunications base stations and cell sites, edge servers, and other telecommunications servers. T-Mobile provides various network service plans to customers for purchase, including through the T-Mobile.com website as well as through T-Mobile-provided services such as its pre-paid mobile service category, T-Mobile Prepaid Unlimited. *See, e.g.*:  https://prepaid.t-mobile.com/home

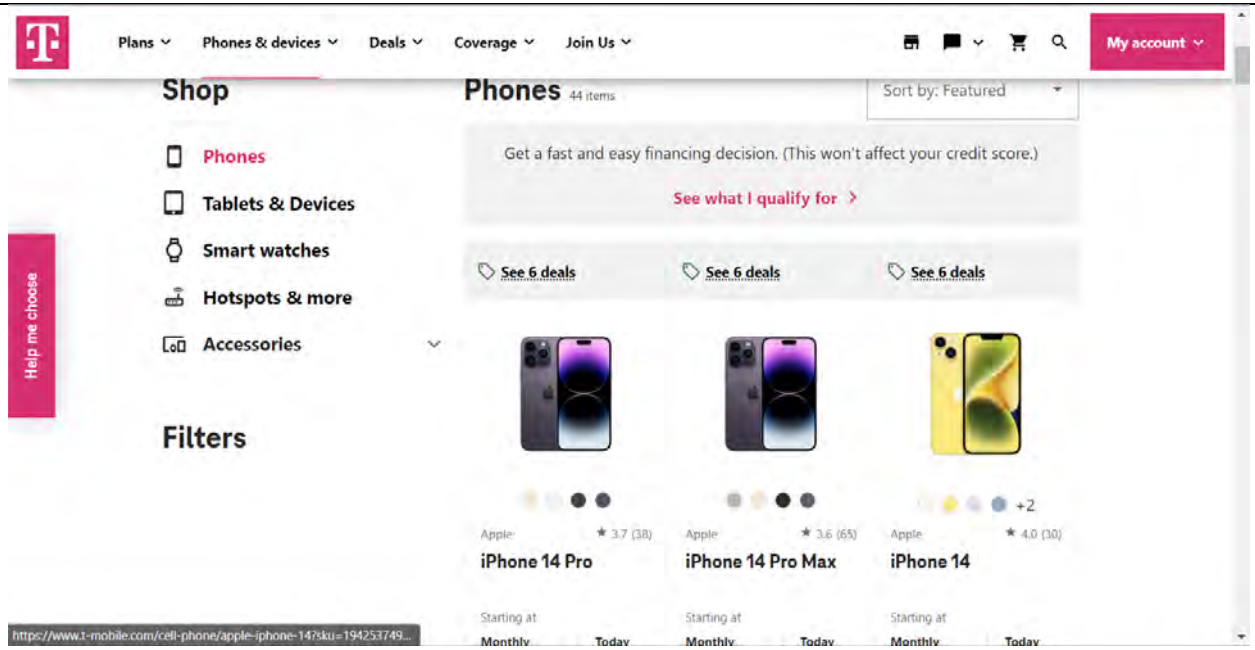


https://prepaid.t-mobile.com/plan-detail/t-mobile-prepaid-plans

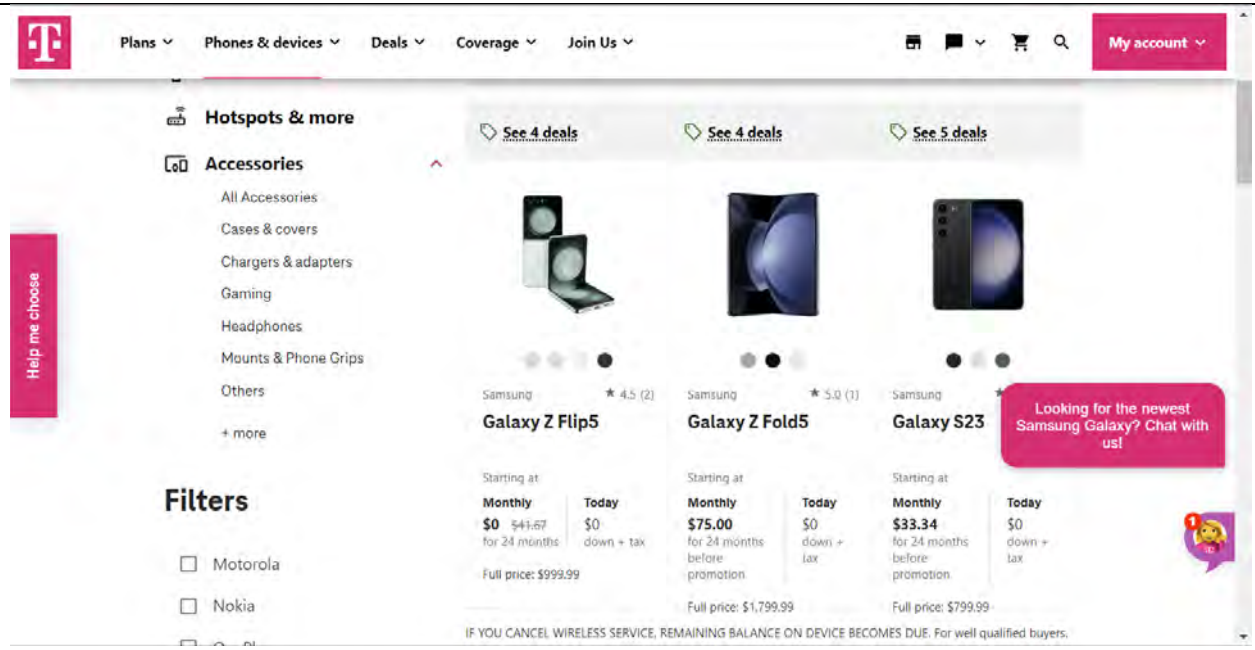


https://www.t-mobile.com/cell-phone-plans

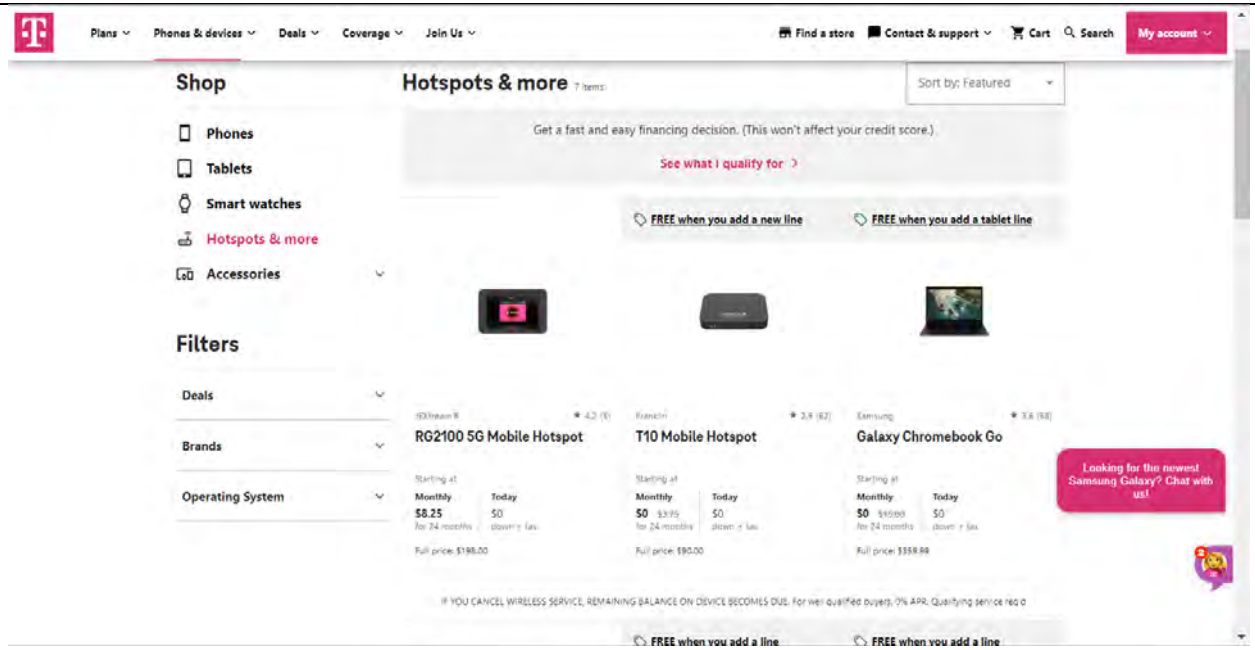
T-Mobile sells mobile devices such as phones, tablets, and hotspot access points which communicate with the T-Mobile wireless service network, which is a wireless access network. Such devices comprise end-user devices, as do devices which customers purchase elsewhere and "bring" to the T-Mobile network. *See, e.g.*:



https://www.t-mobile.com/cell-phones?INTNAV=tNav:Devices:CellPhones



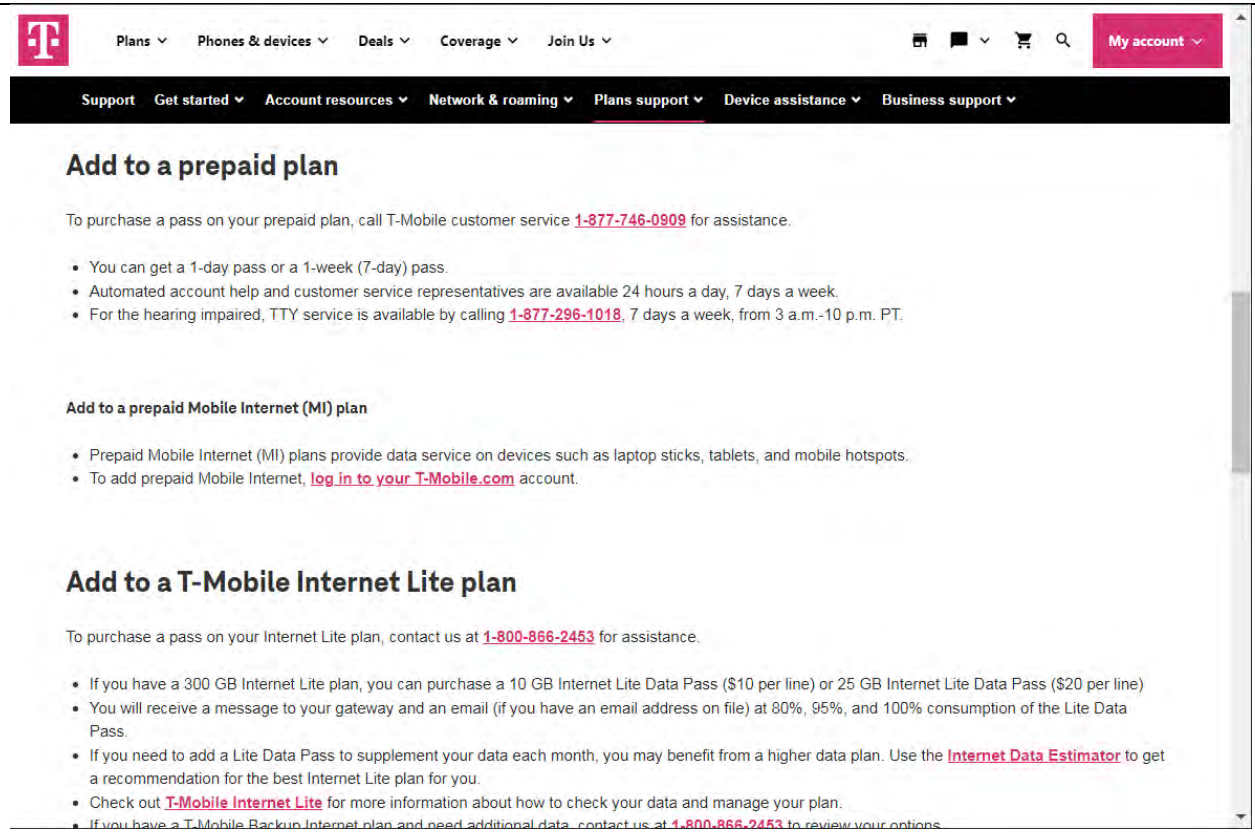
https://www.t-mobile.com/cell-phones/brand/samsung



https://www.t-mobile.com/hotspots-iot-connected-devices

The Accused Instrumentalities use different service plans to provide service, for example, to mobile hotspot devices, mobile phones and tablets provisioned with an "unlimited" data plan, mobile phones and tablets provisioned with a prepaid plan, mobile phones and tablets which for which the associated subscriber account has reached its allotted data limit for the service period, and mobile phones and tablets which are specifically communicating with T-Mobile servers to purchase or increase data allotments (e.g., a T-Mobile "Data Pass").

See, e.g.:



https://www.t-mobile.com/support/plans-features/data-passes#prepaid

Verizon's network receives service plan information from devices which correspond to the subscriber service plan associated with that wireless end-user device, which is a report comprising information about a device service state. For example, Verizon's network receives an attach request, bearer resource allocation request, bearer resource modification request, or PDN connectivity request from a wireless end-user device (UE), which includes a report comprising information about the UE's service state such as UE network capability, UE status, and protocol configuration options (PCO):

Table 8.2.4.1: ATTACH REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length
	Protocol discriminator	Protocol discriminator 9.2	M	V	1/2
	Security header type	Security header type 9.3.1	M	V	1/2
	Attach request message identity	Message type 9.8	M	V	1
	EPS attach type	EPS attach type 9.9.3.11	M	V	1/2
	NAS key set identifier	NAS key set identifier 9.9.3.21	M	V	1/2
	EPS mobile identity	EPS mobile identity 9.9.3.12	M	LV	5-12
	UE network capability	UE network capability 9.9.3.34	M	LV	3-14
	ESM message container	ESM message container 9.9.3.15	M	LV-E	5-n
19	Old P-TMSI signature	P-TMSI signature 9.9.3.26	O	TV	4
50	Additional GUTI	EPS mobile identity 9.9.3.12	O	TLV	13
52	Last visited registered TAI	Tracking area identity 9.9.3.32	O	TV	6
5C	DRX parameter	DRX parameter 9.9.3.8	O	TV	3
31	MS network capability	MS network capability 9.9.3.20	O	TLV	4-10
13	Old location area identification	Location area identification 9.9.2.2	O	TV	6
9-	TMSI status	TMSI status 9.9.3.31	O	TV	1
11	Mobile station classmark 2	Mobile station classmark 2 9.9.2.4	O	TLV	5
20	Mobile station classmark 3	Mobile station classmark 3 9.9.2.5	O	TLV	2-34
40	Supported Codecs	Supported Codec List 9.9.2.10	O	TLV	5-n
F-	Additional update type	Additional update type 9.9.3.0B	O	TV	1
5D	Voice domain preference and UE's usage setting	Voice domain preference and UE's usage setting 9.9.3.44	O	TLV	3
D-	Device properties	Device properties 9.9.2.0A	O	TV	1
E-	Old GUTI type	GUTI type 9.9.3.45	O	TV	1
C-	MS network feature support	MS network feature support 9.9.3.20A	O	TV	1
10	TMSI based NRI container	Network resource identifier container 9.9.3.24A	O	TLV	4
6A	T3324 value	GPRS timer 2 9.9.3.16A	O	TLV	3
5E	T3412 extended value	GPRS timer 3 9.9.3.16B	O	TLV	3
6E	Extended DRX parameters	Extended DRX parameters 9.9.3.46	O	TLV	3
6F	UE additional security capability	UE additional security capability 9.9.3.53	O	TLV	6
6D	UE status	UE status 9.9.3.54	O	TLV	3
17	Additional information requested	Additional information requested 9.9.3.55	O	TV	2

Table 8.3.8.1: BEARER RESOURCE ALLOCATION REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length
	Protocol discriminator	Protocol discriminator 9.2	M	V	1/2
	EPS bearer identity	EPS bearer identity 9.3.2	M	V	1/2
	Procedure transaction identity	Procedure transaction identity 9.4	M	V	1
	Bearer resource allocation request message identity	Message type 9.8	M	V	1
	Linked EPS bearer identity	Linked EPS bearer identity 9.9.4.6	M	V	1/2
	Spare half octet	Spare half octet 9.9.2.9	M	V	1/2
	Traffic flow aggregate	Traffic flow aggregate description 9.9.4.15	M	LV	2-256
	Required traffic flow QoS	EPS quality of service 9.9.4.3	M	LV	2-14
27	Protocol configuration options	Protocol configuration options 9.9.4.11	O	TLV	3-253
C-	Device properties	Device properties 9.9.2.0A	O	TV	1
33	NBIFOM container	NBIFOM container 9.9.4.19	O	TLV	3-257
7B	Extended protocol configuration options	Extended protocol configuration options 9.9.4.26	O	TLV-E	4-65538
5C	Extended EPS QoS	Extended quality of service 9.9.4.30	O	TLV	12

Table 8.3.10.1: BEARER RESOURCE MODIFICATION REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length
	Protocol discriminator	Protocol discriminator 9.2	M	V	1/2
	EPS bearer identity	EPS bearer identity 9.3.2	M	V	1/2
	Procedure transaction identity	Procedure transaction identity 9.4	M	V	1
	Bearer resource modification request message identity	Message type 9.8	M	V	1
	EPS bearer identity for packet filter	Linked EPS bearer identity 9.9.4.6	M	V	1/2
	Spare half octet	Spare half octet 9.9.2.9	M	V	1/2
	Traffic flow aggregate	Traffic flow aggregate description 9.9.4.15	M	LV	2-256
5B	Required traffic flow QoS	EPS quality of service 9.9.4.3	O	TLV	3-15
58	ESM cause	ESM cause 9.9.4.4	O	TV	2
27	Protocol configuration options	Protocol configuration options 9.9.4.11	O	TLV	3-253
C-	Device properties	Device properties 9.9.2.0A	O	TV	1
33	NBIFOM container	NBIFOM container 9.9.4.19	O	TLV	3-257
66	Header compression configuration	Header compression configuration 9.9.4.22	O	TLV	5-257
7B	Extended protocol configuration options	Extended protocol configuration options 9.9.4.26	O	TLV-E	4-65538
5C	Extended EPS QoS	Extended quality of service 9.9.4.30	O	TLV	12

Table 8.3.20.1: PDN CONNECTIVITY REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length
	Protocol discriminator	Protocol discriminator 9.2	M	V	1/2
	EPS bearer identity	EPS bearer identity 9.3.2	M	V	1/2
	Procedure transaction identity	Procedure transaction identity 9.4	M	V	1
	PDN connectivity request message identity	Message type 9.8	M	V	1
	Request type	Request type 9.9.4.14	M	V	1/2
	PDN type	PDN type 9.9.4.10	M	V	1/2
D-	ESM information transfer flag	ESM information transfer flag 9.9.4.5	O	TV	1
28	Access point name	Access point name 9.9.4.1	O	TLV	3-102
27	Protocol configuration options	Protocol configuration options 9.9.4.11	O	TLV	3-253
C-	Device properties	Device properties 9.9.2.0A	O	TV	1
33	NBIFOM container	NBIFOM container 9.9.4.19	O	TLV	3-257
66	Header compression configuration	Header compression configuration 9.9.4.22	O	TLV	5-257
7B	Extended protocol configuration options	Extended protocol configuration options 9.9.4.26	O	TLV-E	4-65538

3GPP TS 24.301 v15.03

Flows

There are three scenarios where the PCO value will be passed to the host:

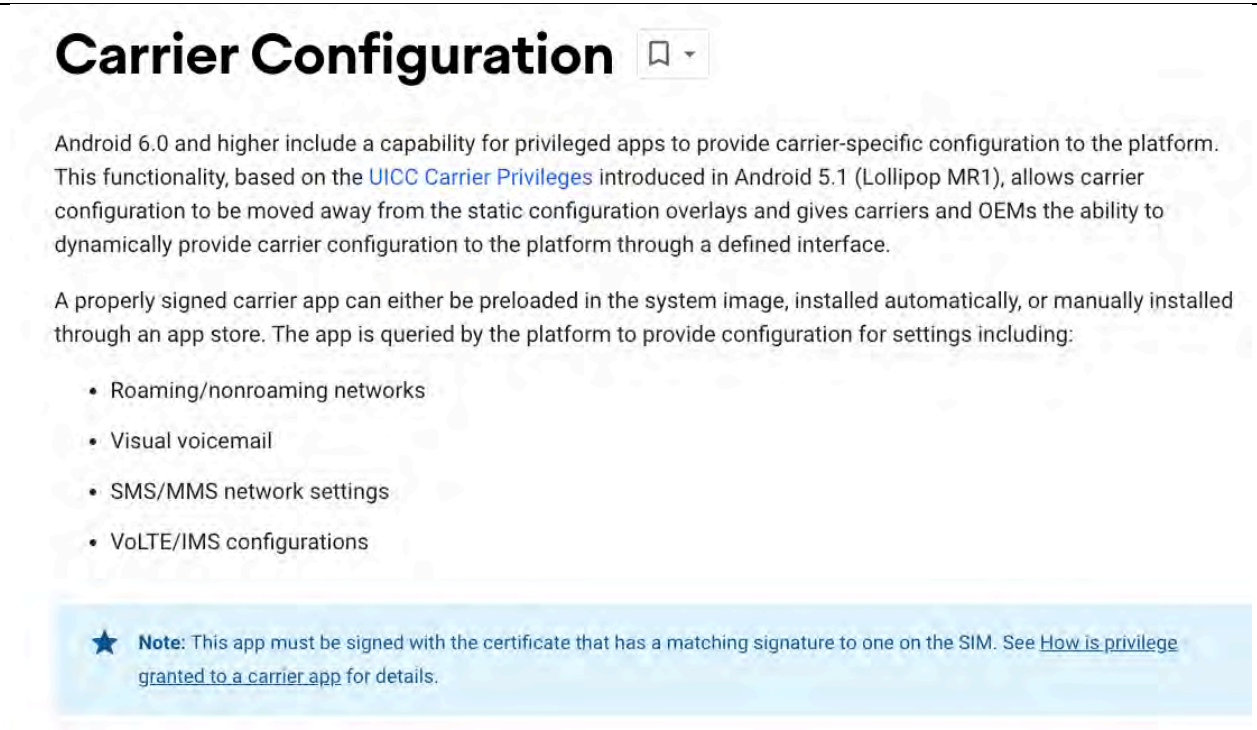
- When a new PCO value has arrived on an activated connection
- When an app or service queries for the latest PCO value from the modem
- When a connection is bridged or activated for the first time and a PCO value already exists in the modem

For the first scenario, the modem should send an NDIS_STATUS_WWAN_PCO_STATUS notification to the OS indicating a new PCO value change whenever a new PCO value is received from the network, with the appropriate NDIS port number to represent the corresponding PDN. To avoid draining the battery unnecessarily, the modem should avoid noisy notifications, as described in Modem behavior with Selective Suspend and Connected Standby.

For the second scenario, when an app or service queries for PCO value from the modem on an activated PDN connection, the host will send the modem an OID_WWAN_PCO query request to read the latest cached PCO value in the modem.

For the third scenario, when a connection is activated or bridged on the host, the modem should send an **NDIS_STATUS_WWAN_PCO_STATUS** notification when a PCO value already exists in the modem for the activated or bridged connection the host requested. The notification should be passed up from the corresponding NDIS port number of the PDN.

	https://learn.microsoft.com/en-us/windows-hardware/drivers/network/mb-protocol-configuration-options-pco-operations
1[b] determining, based on the report, that a particular service policy setting of the wireless end-user device needs to be modified, the particular service policy setting being stored in a protected partition of the wireless end-user device, the protected partition configured to deter or prevent unauthorized modifications to the particular service policy setting, the particular service policy setting being associated with a service profile that provides for access by the wireless end-user device to a network data service over a wireless access network, the particular service policy setting configured to assist in controlling one or more communications associated with the wireless end-user device over the wireless access network; and	The Accused Instrumentalities comprise "determining, based on the report, that a particular service policy setting of the wireless end-user device needs to be modified, the particular service policy setting being stored in a protected partition of the wireless end-user device, the protected partition configured to deter or prevent unauthorized modifications to the particular service policy setting, the particular service policy setting being associated with a service profile that provides for access by the wireless end-user device to a network data service over a wireless access network, the particular service policy setting configured to assist in controlling one or more communications associated with the wireless end-user device over the wireless access network." Examples of such service policy settings on the wireless end-user device include, for example, APN access settings and service plan settings stored on the wireless end-user device, including for example in an encrypted partition of the device or in an encrypted SIM card. Such service policy settings are configured to assist in controlling one or more communications associated with the wireless end-user device over the wireless access network, insofar as the policies are used by T-Mobile to determine the levels of service that are to be provided to the wireless end-user device. Carrier configuration information (which is service profile information) on a given wireless end-user device is secured within the device through the use of privileges and other access settings, including through the use of matching signatures between the carrier settings and one stored with the SIM card information. *See, e.g.*: **Manually update your carrier settings on your iPhone or iPad** Carrier settings updates let your carrier provider update carrier network and related settings to improve cellular network connectivity and performance. Carrier settings updates can also add support for new features like 5G or Wi-Fi Calling. When a carrier settings update is available, you'll be prompted to install it. Installation takes less than one minute, and you can keep using your device normally. If your carrier releases a mandatory update, you'll see an OK button instead of an Update button to let you know that the update was downloaded and installed. https://support.apple.com/en-us/HT201270



Carrier Configuration

Android 6.0 and higher include a capability for privileged apps to provide carrier-specific configuration to the platform. This functionality, based on the UICC Carrier Privileges introduced in Android 5.1 (Lollipop MR1), allows carrier configuration to be moved away from the static configuration overlays and gives carriers and OEMs the ability to dynamically provide carrier configuration to the platform through a defined interface.

A properly signed carrier app can either be preloaded in the system image, installed automatically, or manually installed through an app store. The app is queried by the platform to provide configuration for settings including:

- Roaming/nonroaming networks
- Visual voicemail
- SMS/MMS network settings
- VoLTE/IMS configurations

Note: This app must be signed with the certificate that has a matching signature to one on the SIM. See How is privilege granted to a carrier app for details.

https://source.android.com/docs/core/connect/carrier

	Resetting the modem based on PCO values Based on PCO values received from the network, the modem will be reset in the following scenarios: • The user completed self-activation after receiving PCO = 5 from the network. A new PCO value (3, 0 or anything Mobile Operator App can recognize) will be sent to the OS and the OS will pass it to Mobile Operator App. • The user added more credit to their account after receiving PCO = 3. A new PCO value (0, or anything Mobile Operator App can recognize) will be sent to the OS and the OS will pass it to Mobile Operator App. The host is not aware of the modem being reset, so the activated connections from the host will not be deactivated and the modem should automatically re-establish connection with those PDN after resetting. Upon establishing connection and receiving a new incoming PCO value from the network, the modem will provide an unsolicited NDIS_STATUS_WWAN_PCO_STATUS notification to the host. The following diagram illustrates the modem's reset flow when one of these scenarios occurs, with Verizon Wireless as the example MO: https://learn.microsoft.com/en-us/windows-hardware/drivers/network/mb-protocol-configuration-options-pco-operations
1[c] in response to determining that the particular service policy setting needs to be modified, sending configuration information to the wireless end-user device over the service control link, the configuration information configured to assist in modifying or allowing	The Accused Instrumentalities comprise receiving a report comprising device service states "in response to determining that the particular service policy setting needs to be modified, sending configuration information to the wireless end-user device over the service control link, the configuration information configured to assist in modifying or allowing modifications to the particular service policy setting." T-Mobile's network makes determinations that particular service policies for user devices need to be changed when, for example, a subscriber's service plan is changed or service-related options are activated or deactivated (e.g., the "Data Pass" option or "HD Streaming" option).

modifications to the particular service policy setting.	On information and belief, the Accused Instrumentalities specifically transmit traffic control-related instructions to mobile devices in the wireless access network based on type of traffic, type of subscriber plan, and priority levels for types of data and/or subscriber account type based on the Accused Instrumentalities' inspection of traffic to and from the device and the account associated with the device. For example, the Accused Instrumentalities inspect data traffic to determine if it is for streaming video to devices, and manages data access by that device accordingly. *See, e.g.*:

Activation steps

If you don't have a plan that includes HD streaming, refer to Find the right plan for you to add a plan today.

From the T-Mobile app

1. Open the T-Mobile app. If you don't have it, learn how to download it now.
2. Tap **MORE**
3. Go to **PROFILE SETTINGS**
4. Go to **MEDIA SETTINGS**.
5. If you have multiple lines on your account, make sure the line you're making changes to is showing. If it's not, open the menu to select another line on the account.
6. Next to **HD Video Resolution**, toggle it **ON** or **OFF**.

From T-Mobile.com

1. Log in to T-Mobile.com with your T-Mobile ID. If you don't have one, register for a T-Mobile ID.
2. Select **PROFILE**.
3. Go to **MEDIA SETTINGS**.
4. By **HD Video Resolution**, set the option to **ON** or **OFF**.

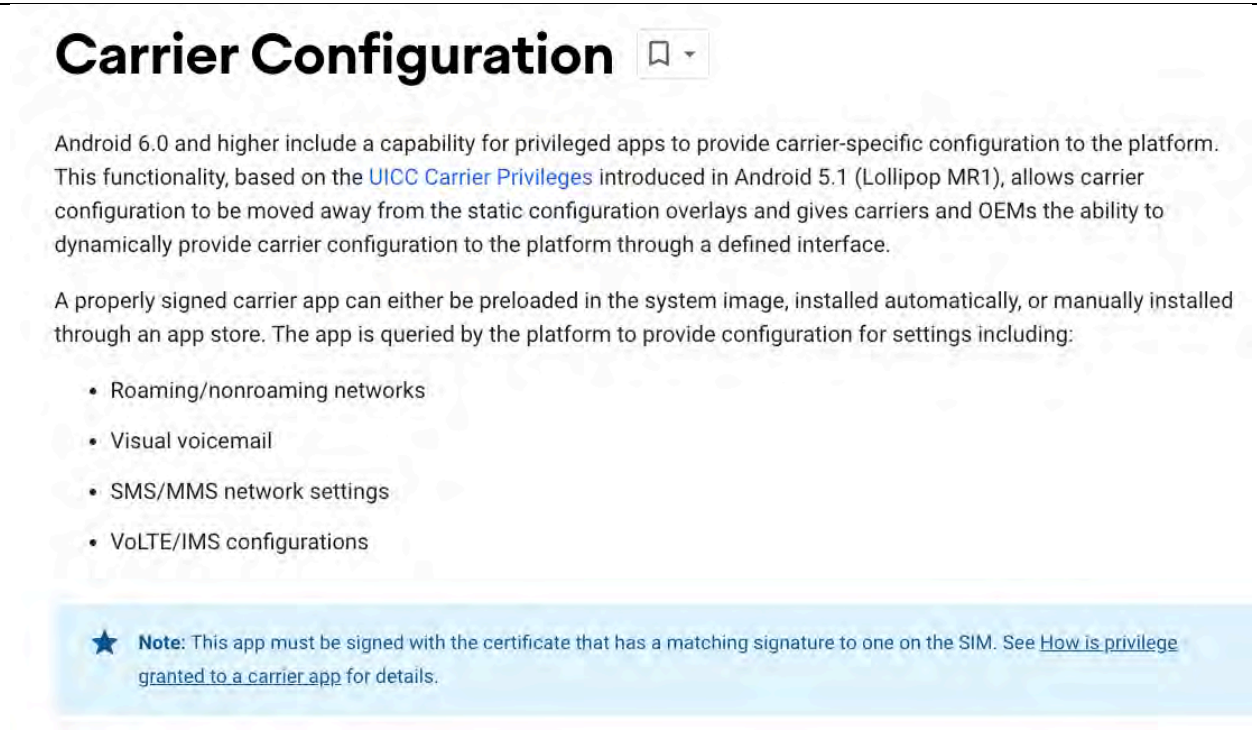
HD video resolution details

- Activating HD video resolution only provides the ability to enable higher-resolution video streams by turning off video optimization. It doesn't change the actual, available resolution of streaming video.
- Video resolution isn't determined by T-Mobile, but rather it's determined by the video content provider like YouTube or Netflix.
- Once you turn it on, HD video streaming availability should take effect immediately, but it may require closing and re-opening the app or browser window, or restarting your device.

Full terms

All on-network data used, including free streaming data, counts toward the heavy-user threshold of 50GB in a billing cycle, after which a T-Mobile-branded customer will no longer receive highest priority on the network. When an HD video is active, streaming high-definition video will use data much faster than optimized video, and brings up to the possibility of de-prioritization if you use enough data to reach that limit in a given month. (Learn more about T-Mobile's Open Internet disclosures.)

	https://www.t-mobile.com/support/plans-features/activate-hd-video-streaming **Unlimited video streaming with Binge On™** As a Simple Choice™ customer, you can stream all the video you want while on our network. Data charges do not apply. During congestion, heavy data users (>50GB/mo. for most plans) and customers choosing lower-prioritized plans may notice lower speeds than other customers. https://www.t-mobile.com/tv-streaming/binge-on **Manually update your carrier settings on your iPhone or iPad** Carrier settings updates let your carrier provider update carrier network and related settings to improve cellular network connectivity and performance. Carrier settings updates can also add support for new features like 5G or Wi-Fi Calling. When a carrier settings update is available, you'll be prompted to install it. Installation takes less than one minute, and you can keep using your device normally. If your carrier releases a mandatory update, you'll see an OK button instead of an Update button to let you know that the update was downloaded and installed. https://support.apple.com/en-us/HT201270



Carrier Configuration

Android 6.0 and higher include a capability for privileged apps to provide carrier-specific configuration to the platform. This functionality, based on the UICC Carrier Privileges introduced in Android 5.1 (Lollipop MR1), allows carrier configuration to be moved away from the static configuration overlays and gives carriers and OEMs the ability to dynamically provide carrier configuration to the platform through a defined interface.

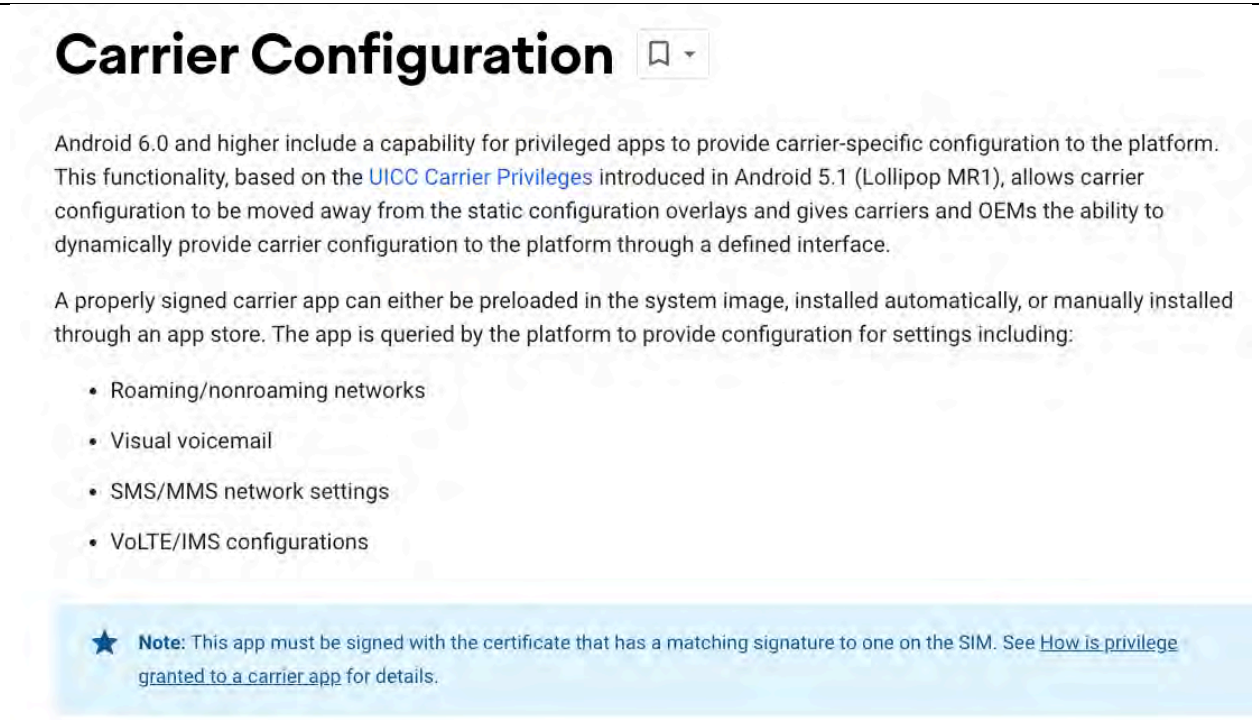
A properly signed carrier app can either be preloaded in the system image, installed automatically, or manually installed through an app store. The app is queried by the platform to provide configuration for settings including:

- Roaming/nonroaming networks
- Visual voicemail
- SMS/MMS network settings
- VoLTE/IMS configurations

Note: This app must be signed with the certificate that has a matching signature to one on the SIM. See How is privilege granted to a carrier app for details.

https://source.android.com/docs/core/connect/carrier

	Resetting the modem based on PCO values Based on PCO values received from the network, the modem will be reset in the following scenarios: • The user completed self-activation after receiving PCO = 5 from the network. A new PCO value (3, 0 or anything Mobile Operator App can recognize) will be sent to the OS and the OS will pass it to Mobile Operator App. • The user added more credit to their account after receiving PCO = 3. A new PCO value (0, or anything Mobile Operator App can recognize) will be sent to the OS and the OS will pass it to Mobile Operator App. The host is not aware of the modem being reset, so the activated connections from the host will not be deactivated and the modem should automatically re-establish connection with those PDN after resetting. Upon establishing connection and receiving a new incoming PCO value from the network, the modem will provide an unsolicited NDIS_STATUS_WWAN_PCO_STATUS notification to the host. The following diagram illustrates the modem's reset flow when one of these scenarios occurs, with Verizon Wireless as the example MO: https://learn.microsoft.com/en-us/windows-hardware/drivers/network/mb-protocol-configuration-options-pco-operations
2. The method of claim 1, wherein the particular service policy setting assists in implementing a roaming control, a parental control, or an enterprise wireless wide-area network (WWAN) management control.	The Accused Instrumentalities comprise the particular service policy setting assists in implementing a roaming control. On information and belief, the protocol configuration options information assists in modifying the service policy setting which controls cellular communications, including when the mobile device is roaming. *See, e.g.*:



Carrier Configuration

Android 6.0 and higher include a capability for privileged apps to provide carrier-specific configuration to the platform. This functionality, based on the UICC Carrier Privileges introduced in Android 5.1 (Lollipop MR1), allows carrier configuration to be moved away from the static configuration overlays and gives carriers and OEMs the ability to dynamically provide carrier configuration to the platform through a defined interface.

A properly signed carrier app can either be preloaded in the system image, installed automatically, or manually installed through an app store. The app is queried by the platform to provide configuration for settings including:

- Roaming/nonroaming networks
- Visual voicemail
- SMS/MMS network settings
- VoLTE/IMS configurations

Note: This app must be signed with the certificate that has a matching signature to one on the SIM. See How is privilege granted to a carrier app for details.

https://source.android.com/docs/core/connect/carrier

Resetting the modem based on PCO values

Based on PCO values received from the network, the modem will be reset in the following scenarios:

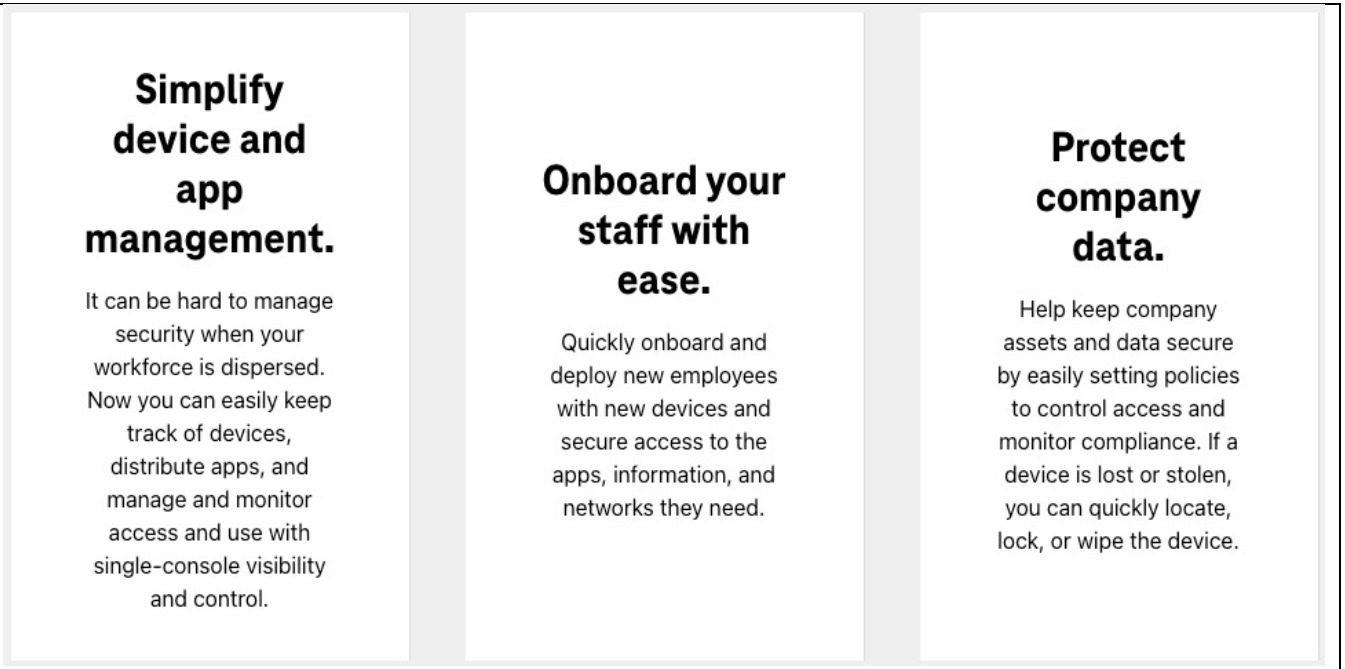
- The user completed self-activation after receiving PCO = 5 from the network. A new PCO value (3, 0 or anything Mobile Operator App can recognize) will be sent to the OS and the OS will pass it to Mobile Operator App.
- The user added more credit to their account after receiving PCO = 3. A new PCO value (0, or anything Mobile Operator App can recognize) will be sent to the OS and the OS will pass it to Mobile Operator App.

The host is not aware of the modem being reset, so the activated connections from the host will not be deactivated and the modem should automatically re-establish connection with those PDN after resetting. Upon establishing connection and receiving a new incoming PCO value from the network, the modem will provide an unsolicited NDIS_STATUS_WWAN_PCO_STATUS notification to the host.

The following diagram illustrates the modem's reset flow when one of these scenarios occurs, with Verizon Wireless as the example MO:

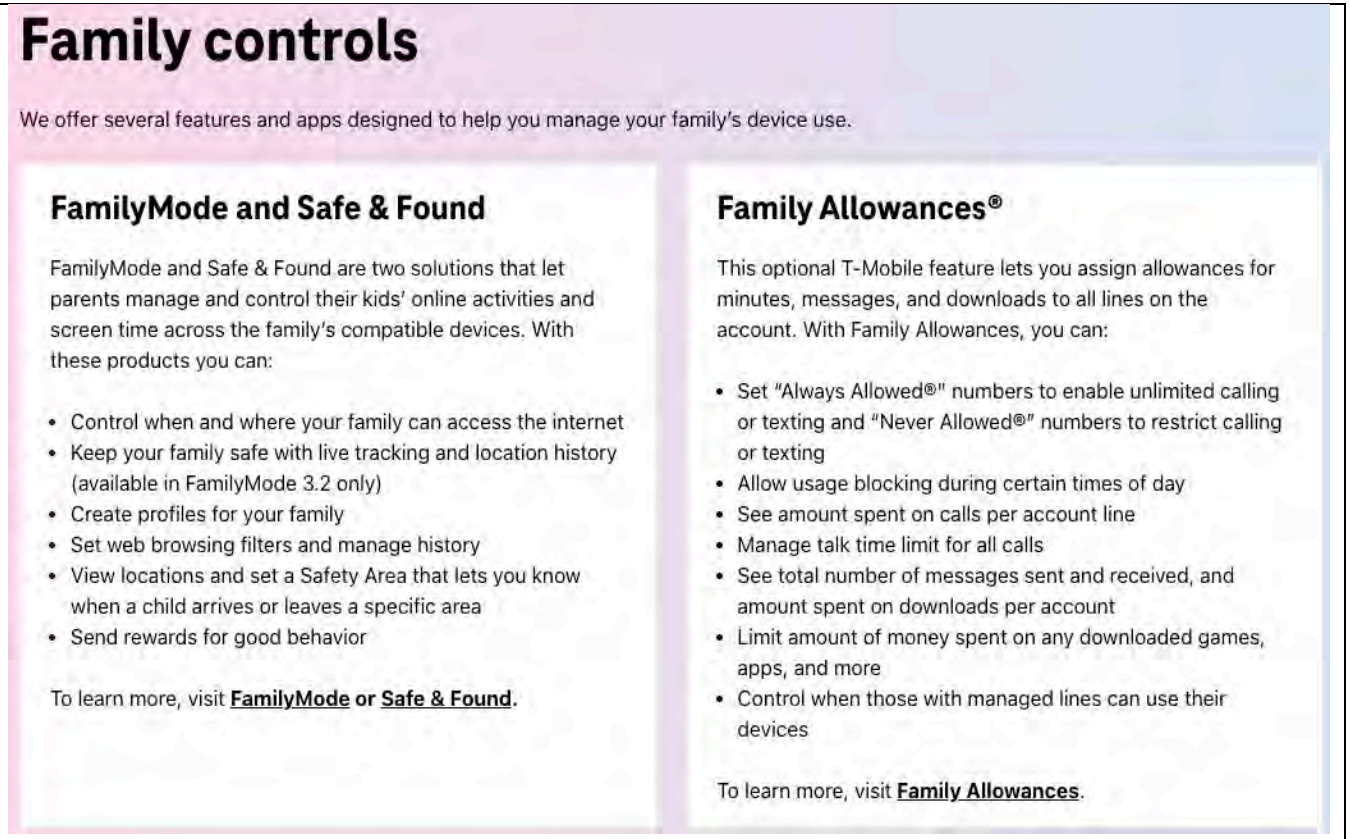
https://learn.microsoft.com/en-us/windows-hardware/drivers/network/mb-protocol-configuration-options-pco-operations

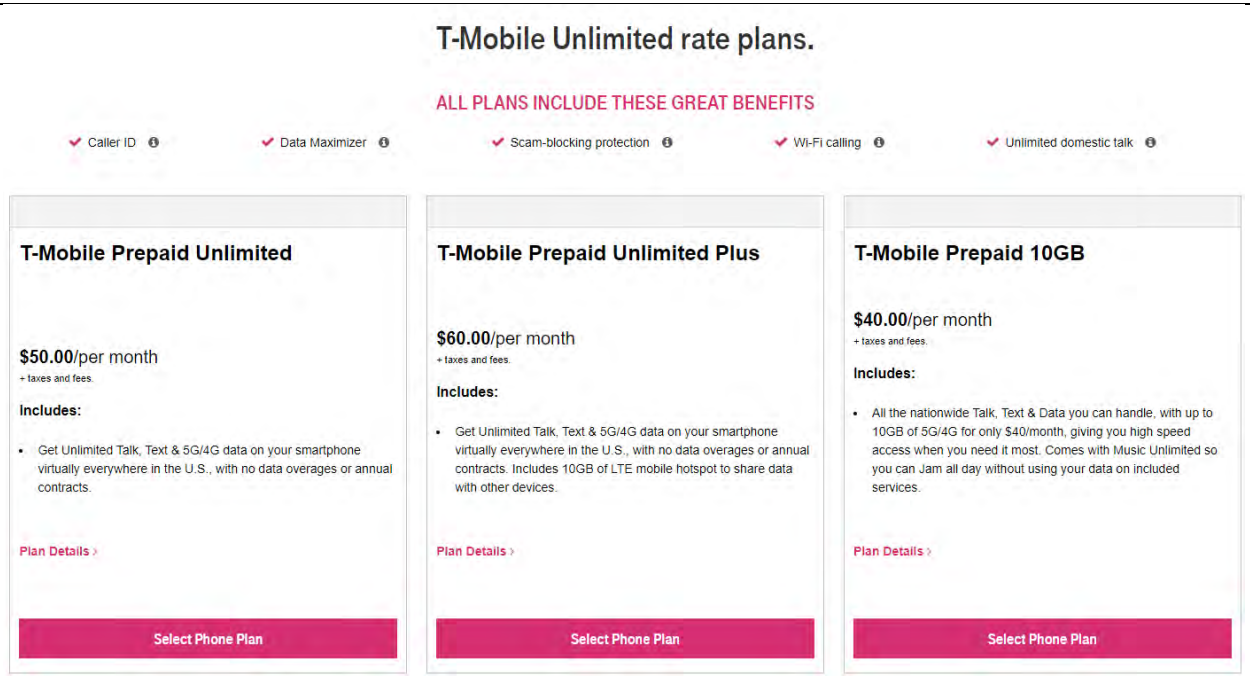
The Accused Instrumentalities comprise the particular service policy setting assists in implementing an enterprise wireless wide-area network (WWAN) management control. On information and belief, the protocol configuration options information assists in modifying the service policy setting which controls cellular communications, including when the mobile device is used in an enterprise. *See, e.g.*:



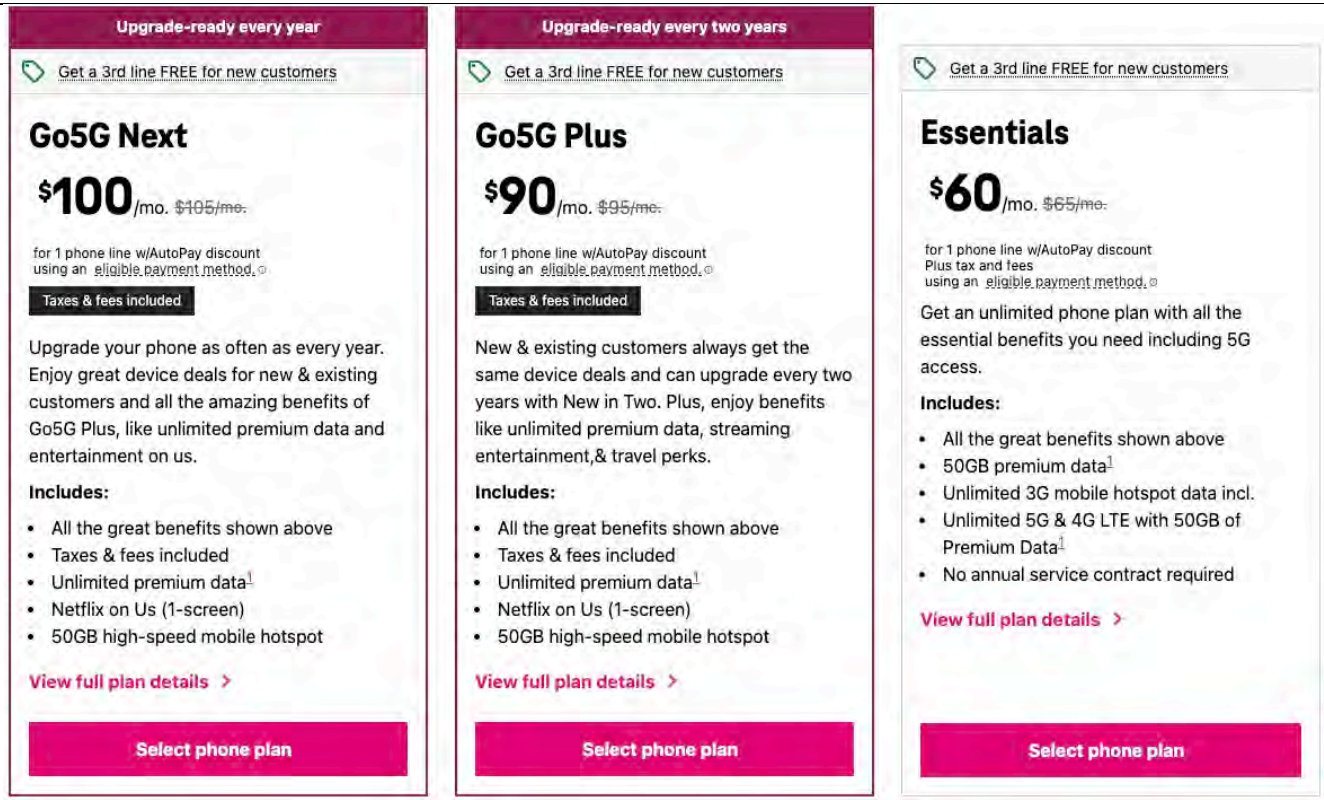
https://www.t-mobile.com/business/solutions/security/mobile-device-management

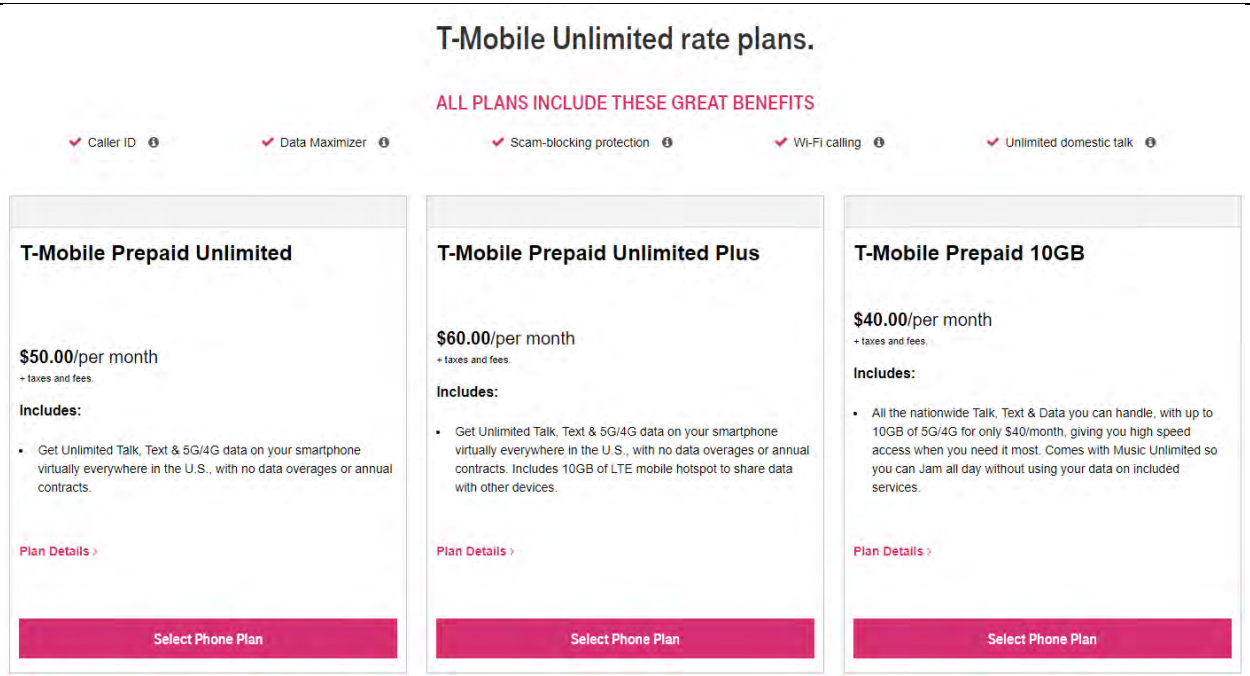
The Accused Instrumentalities comprise the particular service policy setting assists in implementing parental controls. On information and belief, the protocol configuration options information assists in modifying the service policy setting which controls cellular communications, including when the mobile device is used in a family account. *See, e.g.*:

	 https://www.t-mobile.com/privacy-center/education/family-controls
3. The method of claim 1, wherein the wireless end-user device is an intermediate networking device for forwarding traffic between a wireless wide-area network (WWAN) and a wireless local-area network (WLAN).	The Accused Instrumentalities comprise sending configuration information to the wireless end-user device wherein the wireless end-user device is an intermediate networking device for forwarding traffic between a wireless wide-area network (WWAN) and a wireless local-area network (WLAN). Mobile devices such as phones, tablets, and hotspot access points which communicate with the T-Mobile wireless service network (a wireless wide-area network (WWAN)) and have a mobile hotspot feature are intermediate networking devices that forward traffic between T-Mobile's network (WWAN) and a local WiFi network (WLAN). *See, e.g.*:

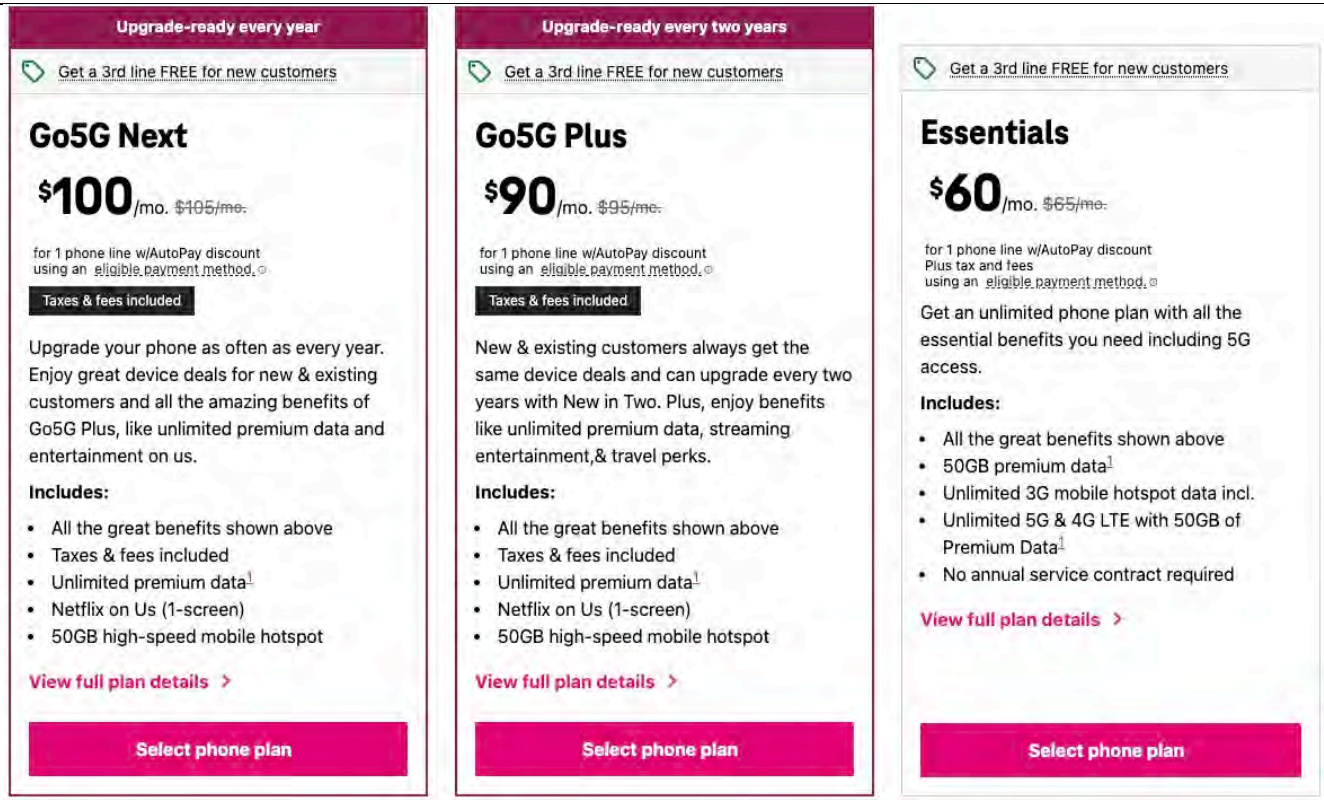


https://prepaid.t-mobile.com/plan-detail/t-mobile-prepaid-plans

	 https://www.t-mobile.com/cell-phone-plans
4. The method of claim 1, wherein the wireless end-user device is an intermediate networking device comprising a cellular device, the intermediate networking device for forwarding traffic between the wireless access network and a second network.	The Accused Instrumentalities comprise sending configuration information to the wireless end-user device wherein the wireless end-user device is an intermediate networking device comprising a cellular device, the intermediate networking device for forwarding traffic between the wireless access network and a second network. Mobile devices such as phones, tablets, and hotspot access points (cellular devices) which communicate with the T-Mobile wireless service network (a wireless wide-area network (WWAN)) and have a mobile hotspot feature are intermediate networking devices that forward traffic between T-Mobile's network (WWAN) and a local WiFi network (WLAN).



https://prepaid.t-mobile.com/plan-detail/t-mobile-prepaid-plans

	 https://www.t-mobile.com/cell-phone-plans
5. The method of claim 1, wherein the wireless end-user device is an intermediate networking device, and the particular service policy setting assists one or more other end-user devices in communicating over the wireless access network via the intermediate networking device.	The Accused Instrumentalities comprise sending configuration information to the wireless end-user device wherein the wireless end-user device is an intermediate networking device, and the particular service policy setting assists one or more other end-user devices in communicating over the wireless access network via the intermediate networking device. *See* claim 4; *see also, e.g.*:

Manually update your carrier settings on your iPhone or iPad

Carrier settings updates let your carrier provider update carrier network and related settings to improve cellular network connectivity and performance. Carrier settings updates can also add support for new features like 5G or Wi-Fi Calling.

When a carrier settings update is available, you'll be prompted to install it. Installation takes less than one minute, and you can keep using your device normally. If your carrier releases a mandatory update, you'll see an OK button instead of an Update button to let you know that the update was downloaded and installed.

https://support.apple.com/en-us/HT201270

Carrier Configuration

Android 6.0 and higher include a capability for privileged apps to provide carrier-specific configuration to the platform. This functionality, based on the UICC Carrier Privileges introduced in Android 5.1 (Lollipop MR1), allows carrier configuration to be moved away from the static configuration overlays and gives carriers and OEMs the ability to dynamically provide carrier configuration to the platform through a defined interface.

A properly signed carrier app can either be preloaded in the system image, installed automatically, or manually installed through an app store. The app is queried by the platform to provide configuration for settings including:

- Roaming/nonroaming networks
- Visual voicemail
- SMS/MMS network settings
- VoLTE/IMS configurations

Note: This app must be signed with the certificate that has a matching signature to one on the SIM. See How is privilege granted to a carrier app for details.

https://source.android.com/docs/core/connect/carrier

Resetting the modem based on PCO values

Based on PCO values received from the network, the modem will be reset in the following scenarios:

- The user completed self-activation after receiving PCO = 5 from the network. A new PCO value (3, 0 or anything Mobile Operator App can recognize) will be sent to the OS and the OS will pass it to Mobile Operator App.
- The user added more credit to their account after receiving PCO = 3. A new PCO value (0, or anything Mobile Operator App can recognize) will be sent to the OS and the OS will pass it to Mobile Operator App.

The host is not aware of the modem being reset, so the activated connections from the host will not be deactivated and the modem should automatically re-establish connection with those PDN after resetting. Upon establishing connection and receiving a new incoming PCO value from the network, the modem will provide an unsolicited NDIS_STATUS_WWAN_PCO_STATUS notification to the host.

The following diagram illustrates the modem's reset flow when one of these scenarios occurs, with Verizon Wireless as the example MO:

https://learn.microsoft.com/en-us/windows-hardware/drivers/network/mb-protocol-configuration-options-pco-operations

As another example, the Accused Instrumentalities comprise sending configuration information to the wireless end-user device wherein the wireless end-user device is an intermediate networking device, and the particular service policy setting assists one or more other end-user devices in communicating over the wireless access network via the intermediate networking device. *See* claim 4; *see also, e.g.*:

About Bluetooth, Wi-Fi, and cellular on your Apple Watch

Learn about Bluetooth and Wi-Fi for your Apple Watch and how your watch uses both. And learn how cellular on GPS + Cellular models fits in.

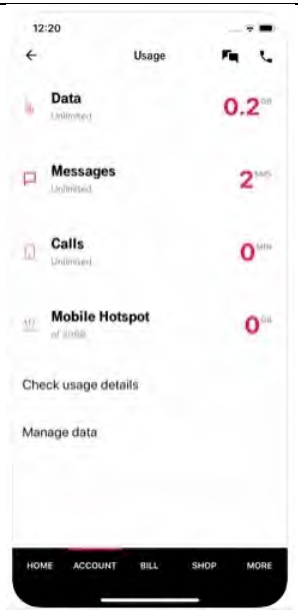
To enjoy every feature on your Apple Watch, you need to turn on Wi-Fi and Bluetooth on your paired iPhone. Open Control Center on your iPhone, then make sure that Wi-Fi and Bluetooth are on.

Your Apple Watch uses Wi-Fi and Bluetooth to communicate with your paired iPhone. If you have cellular, your watch can also stay connected through a cellular network. Your watch switches between these intelligently to choose the most power-efficient connection. Here's how:

- Your Apple Watch uses Bluetooth when your iPhone is near, which conserves power.
- If Bluetooth isn't available, your Apple Watch will try to use Wi-Fi. For example, if compatible Wi-Fi is available and your iPhone isn't in Bluetooth range, your Apple Watch uses Wi-Fi.
- If Bluetooth and Wi-Fi aren't available, and you set up a cellular plan, cellular models of Apple Watch can connect to cellular networks.

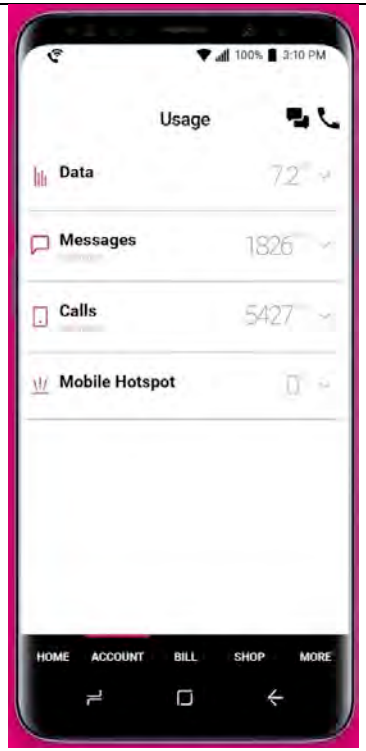
https://support.apple.com/en-us/HT204562

	3. Select your plan and activate cellular service. When you pair a new watch with the Galaxy Wearable app, you will be asked to select a T-Mobile plan to use with it. 1. Select **Set up a mobile plan** in the Galaxy Wearable App (if you choose to skip this step, you can set up cellular later in the Galaxy Wearable app by selecting **Watch Settings > Mobile Plans**). 2. Verify your T-Mobile account (if you're setting up for yourself, you will be asked to verify the last 4 digits of the primary account holder's SSN). 3. Choose your plan and select **Continue**. 4. Move to the bottom of the service agreement to accept, then select **Continue**. 5. Select **Use Plan** to download the eSIM Profile on your watch. https://www.t-mobile.com/support/smartwatches/samsung
6. The method of claim 1, further comprising: obtaining a service usage measure, the service usage measure accounting for the one or more communications associated with the wireless end-user device over the wireless access network; and based on the service usage measure, taking an action.	The Accused Instrumentalities comprise obtaining a service usage measure that includes a measure of service usage activity, the service usage measure accounting for the one or more communications associated with the wireless end-user device over the wireless access network; and based on the service usage measure, taking an action. On information and belief, the Accused Instrumentalities obtain a service usage measure accounting for communications associated with the mobile device over T-Mobile's wireless access network, including a measure of service usage activity such as information indicating overall cellular data usage and mobile hotspot data usage for the service period. Based on the service usage measure, the Accused Instrumentalities take an action such as sending configuration information that modifies a policy setting to allow, block or throttle cellular data usage or mobile hotspot data usage. *See* claim 1. *See also, e.g.*:



https://apps.apple.com/us/app/t-mobile/id561625752?platform=iphone

https://apps.apple.com/us/app/t-mobile/id561625752?platform=ipad

	 https://play.google.com/store/apps/details?id=com.tmobile.pr.mytmobile&&pli=1
7. The method of claim 6, wherein the service usage measure comprises a measure of a service usage activity.	The Accused Instrumentalities comprise obtaining a service usage measure that includes a measure of service usage activity, the service usage measure accounting for the one or more communications associated with the wireless end-user device over the wireless access network; and based on the service usage measure, taking an action. On information and belief, the Accused Instrumentalities obtain a service usage measure accounting for communications associated with the mobile device over T-Mobile's wireless access network, including a measure of service usage activity such as information indicating overall cellular data usage and mobile hotspot data usage for the service period. Based on the service usage measure, the Accused Instrumentalities take an action such as sending configuration information that modifies a policy setting to allow, block or throttle cellular data usage or mobile hotspot data usage. *See* claim 6.

8. The method of claim 6, wherein the action is to verify the service usage measure.	The Accused Instrumentalities comprise obtaining a service usage measure that includes a measure of service usage activity, the service usage measure accounting for the one or more communications associated with the wireless end-user device over the wireless access network; and based on the service usage measure, taking an action, wherein the action is to verify the service usage measure. On information and belief, based on the service usage measure indicating overall cellular data usage and mobile hotspot data usage for the service period, the Accused Instrumentalities verify the service usage measure to ensure that it accounts for the actual service usage of the mobile device. *See* claim 6.
9. The method of claim 6, wherein the action is to quarantine or suspend the wireless end-user device.	The Accused Instrumentalities comprise obtaining a service usage measure, the service usage measure accounting for the one or more communications associated with the wireless end-user device over the wireless access network; and based on the service usage measure, taking an action to quarantine or suspend the wireless end-user device. On information and belief, the Accused Instrumentalities obtain a service usage measure indicating a prohibited service usage activity under T-Mobile's Acceptable Use Policy, and based on the service measure, quarantine or suspend the mobile device. *See, e.g.*: **CAN T-MOBILE CHANGE, SUSPEND OR TERMINATE MY SERVICES OR THIS AGREEMENT?** Yes. Except as described below for Rate Plans with the price-lock guarantee (including the "Un-Contract Promise"), we may change, limit, suspend or terminate your Service or this Agreement at any time, including if you engage in any of the prohibited uses described in these T&Cs, no longer reside in a T-Mobile-owned network coverage area, or engage in harassing, threatening, abusive or offensive behavior. If your Service, Product, or account is limited, suspended, or terminated and then reinstated, you may be charged a reconnection fee. Your account may still accrue charges even if the Service is suspended. You are responsible for any charges that are incurred while your Service or account is suspended. Under certain limited circumstances, we may also block your Device from working on our network. If the change to your Service, Product, or Rate Plan will have a material adverse effect on you, we will provide 14 days' notice of the change. You'll agree to any change by using your Service or Product after the effective date of the change. We may exclude certain types of calls, messages or sessions (e.g. conference and chat lines, broadcast, international, 900 or 976 calls, etc.), in our sole discretion, without further notice. For information about our unlocking policy, visit www.t-mobile.com/responsibility/consumer-info/policies/sim-unlock-policy.

Unless explicitly permitted by your Rate Plan or Data Plan, you are not permitted to use your Device or the Services in a way that we determine:

- Uses a repeater or signal booster other than one we provide to you;
- Compromises network security or capacity, degrades network performance, uses malicious software or "malware", hinders other customers' access to the network, or otherwise adversely impacts network service levels or legitimate data flows;
- Uses applications that automatically consume unreasonable amounts of available network capacity;
- Uses applications which are designed for unattended use, automatic data feeds, automated machine-to-machine connections, or applications that are used in a way that degrades network capacity or functionality;
- Misuses the Service, including "spamming" or sending abusive, unsolicited, or other mass automated communications;
- Accesses the accounts of others without authority;
- Results in more than 50% of your voice and/or data usage being Off-Net (i.e., connected to another provider's network) for any 2 billing cycles within any 12-month period;
- Results in unusually high usage (meeting the definition of a heavy data user for your Rate Plan) and the majority of your data usage being Smartphone Mobile HotSpot (tethering) usage for any 3 billing cycles within any 6-month period;
- Uses a fixed wireless device (provided for use in a fixed location) at a location or address other than the one provided at activation;
- Resells the Service, either alone or as part of any other good or service;
- Tampers with, reprograms, alters, or otherwise modifies your Device to circumvent any of our policies or violate anyone's intellectual property rights;
- Causes harm or adversely affects us, the network, our customers, employees, business, or any other person;
- Conflicts with applicable law;
- Is not in accordance with these T&Cs; or
- Attempts or assists or facilitates anyone else in any of the above activities.

https://www.t-mobile.com/responsibility/legal/terms-and-conditions

Other network management

If you use your data plan in a manner that could interfere with other customers' service, affect our ability to allocate network capacity among customers, or degrade service quality for other customers, we may suspend, terminate, or restrict your data session, or switch you to a more appropriate data plan, or terminate your service.

https://www.t-mobile.com/responsibility/consumer-info/policies/internet-service

12. The method of claim 1, wherein the configuration information comprises at least a portion of the service profile.	The Accused Instrumentalities comprise sending the configuration information, wherein the configuration information comprises a portion of the service profile stored in an encrypted partition of the device or in an encrypted SIM card. *See* claim 1.
13. The method of claim 1, wherein the service control link is secured by an encryption protocol.	The Accused Instrumentalities comprise sending configuration information over the service control link, wherein the service control link is secured by an encryption protocol. 4.4.4 Integrity protection of NAS signalling messages 4.4.4.1 General For the UE, integrity protected signalling is mandatory for the NAS messages once a valid EPS security context exists and has been taken into use. For the network, integrity protected signalling is mandatory for the NAS messages once a secure exchange of NAS messages has been established for the NAS signalling connection. Integrity protection of all NAS signalling messages is the responsibility of the NAS. It is the network which activates integrity protection. 4.4.4.3 Integrity checking of NAS signalling messages in the MME Except the messages listed below, no NAS signalling messages shall be processed by the receiving EMM entity in the MME or forwarded to the ESM entity, unless the secure exchange of NAS messages has been established for the NAS signalling connection: - EMM messages: - ATTACH REQUEST;

6.1.1 General

This clause describes the procedures used for EPS session management (ESM) at the radio interface (reference point "LTE-Uu").

The main function of the ESM sublayer is to support the EPS bearer context handling in the UE and in the MME.

The ESM comprises procedures for:

- the activation, deactivation and modification of EPS bearer contexts;
- the request for resources (IP connectivity to a PDN or dedicated bearer resources) by the UE; and
- the transport of user data via the control plane between the UE and the MME.

Each EPS bearer context represents an EPS bearer between the UE and a PDN. EPS bearer contexts can remain activated even if the radio and S1 bearers constituting the corresponding EPS bearers between UE and MME are temporarily released.

An EPS bearer context can be either a default bearer context or a dedicated bearer context.

A default EPS bearer context is activated when the UE requests a connection to a PDN.

Generally, ESM procedures can be performed only if an EMM context has been established between the UE and the MME, and the secure exchange of NAS messages has been initiated by the MME by use of the EMM procedures described in clause 5. The first default EPS bearer context, however, can be activated during the EPS attach procedure (see subclause 4.2). Once the UE is successfully attached, and the first default EPS bearer context has been activated during or after the attach procedure, the UE can request the MME to set up connections to additional PDNs. For each additional connection, the MME will activate a separate default EPS bearer context. A default EPS bearer context remains activated throughout the lifetime of the connection to the PDN.

6.1.2 Types of ESM procedures

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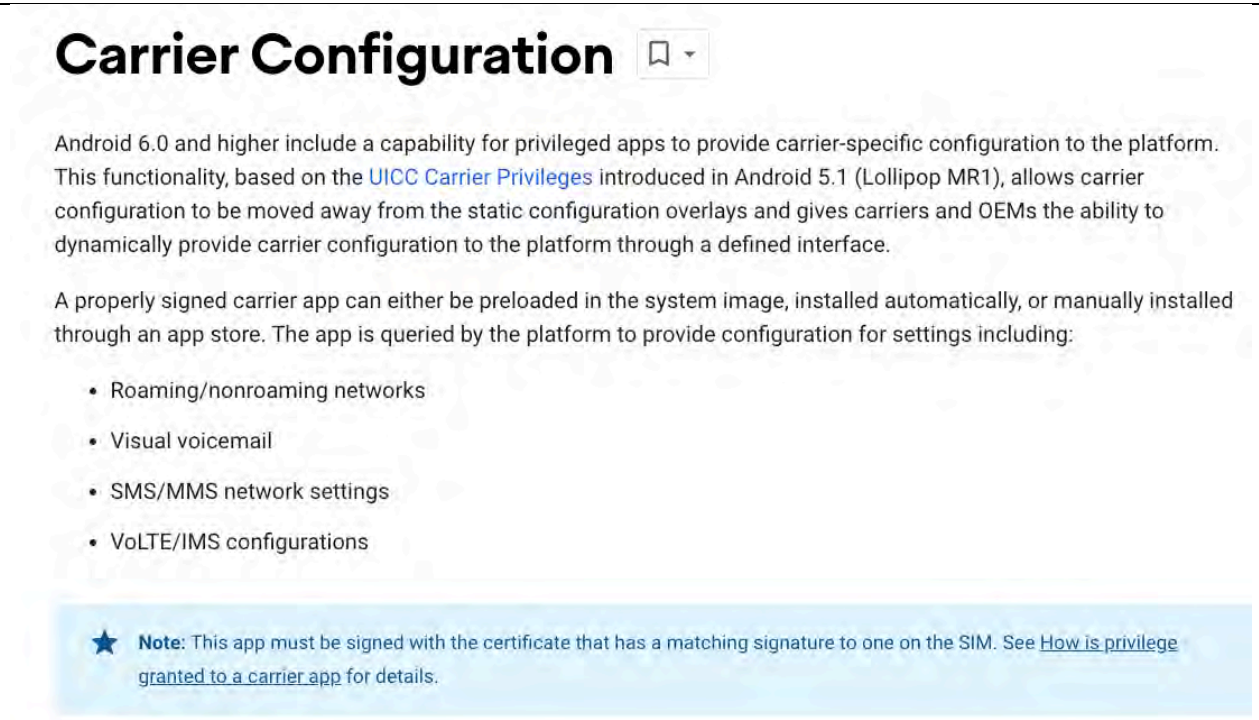
	2) Transaction related procedures: These procedures are initiated by the UE to request for resources, i.e. a new PDN connection or dedicated bearer resources, or to release these resources: - PDN connectivity procedure; - PDN disconnect procedure; - bearer resource allocation procedure; - bearer resource modification procedure. 3GPP TS 24.301 v15.03
14. The method of claim 1, wherein the device service state comprises a service profile setting, a service usage policy setting, or a device-assisted services (DAS) setting.	The Accused Instrumentalities comprise receiving, over a service control link, a report from a wireless end-user device, the report comprising information about a device service state, wherein the device service state comprises a service profile setting, a service usage policy setting, or a device-assisted services (DAS) setting. *See* claim 1. *See also, e.g.*: **Manually update your carrier settings on your iPhone or iPad** Carrier settings updates let your carrier provider update carrier network and related settings to improve cellular network connectivity and performance. Carrier settings updates can also add support for new features like 5G or Wi-Fi Calling. When a carrier settings update is available, you'll be prompted to install it. Installation takes less than one minute, and you can keep using your device normally. If your carrier releases a mandatory update, you'll see an OK button instead of an Update button to let you know that the update was downloaded and installed. https://support.apple.com/en-us/HT201270



Carrier Configuration

Android 6.0 and higher include a capability for privileged apps to provide carrier-specific configuration to the platform. This functionality, based on the UICC Carrier Privileges introduced in Android 5.1 (Lollipop MR1), allows carrier configuration to be moved away from the static configuration overlays and gives carriers and OEMs the ability to dynamically provide carrier configuration to the platform through a defined interface.

A properly signed carrier app can either be preloaded in the system image, installed automatically, or manually installed through an app store. The app is queried by the platform to provide configuration for settings including:

- Roaming/nonroaming networks
- Visual voicemail
- SMS/MMS network settings
- VoLTE/IMS configurations

Note: This app must be signed with the certificate that has a matching signature to one on the SIM. See How is privilege granted to a carrier app for details.

https://source.android.com/docs/core/connect/carrier

	Resetting the modem based on PCO values Based on PCO values received from the network, the modem will be reset in the following scenarios: • The user completed self-activation after receiving PCO = 5 from the network. A new PCO value (3, 0 or anything Mobile Operator App can recognize) will be sent to the OS and the OS will pass it to Mobile Operator App. • The user added more credit to their account after receiving PCO = 3. A new PCO value (0, or anything Mobile Operator App can recognize) will be sent to the OS and the OS will pass it to Mobile Operator App. The host is not aware of the modem being reset, so the activated connections from the host will not be deactivated and the modem should automatically re-establish connection with those PDN after resetting. Upon establishing connection and receiving a new incoming PCO value from the network, the modem will provide an unsolicited NDIS_STATUS_WWAN_PCO_STATUS notification to the host. The following diagram illustrates the modem's reset flow when one of these scenarios occurs, with Verizon Wireless as the example MO: https://learn.microsoft.com/en-us/windows-hardware/drivers/network/mb-protocol-configuration-options-pco-operations
16. The method of claim 1, wherein the device service state comprises information associated with an encryption key.	The Accused Instrumentalities comprise receiving, over a service control link, a report from a wireless end-user device, the report comprising information about a device service state, wherein the device service state comprises information associated with an encryption key. *See, e.g.*:

Table 8.2.4.1: ATTACH REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length
	Protocol discriminator	Protocol discriminator 9.2	M	V	1/2
	Security header type	Security header type 9.3.1	M	V	1/2
	Attach request message identity	Message type 9.8	M	V	1
	EPS attach type	EPS attach type 9.9.3.11	M	V	1/2
	NAS key set identifier	NAS key set identifier 9.9.3.21	M	V	1/2
	EPS mobile identity	EPS mobile identity 9.9.3.12	M	LV	5-12
	UE network capability	UE network capability 9.9.3.34	M	LV	3-14
	ESM message container	ESM message container 9.9.3.15	M	LV-E	5-n
19	Old P-TMSI signature	P-TMSI signature 9.9.3.26	O	TV	4
50	Additional GUTI	EPS mobile identity 9.9.3.12	O	TLV	13
52	Last visited registered TAI	Tracking area identity 9.9.3.32	O	TV	6
5C	DRX parameter	DRX parameter 9.9.3.8	O	TV	3
31	MS network capability	MS network capability 9.9.3.20	O	TLV	4-10
13	Old location area identification	Location area identification 9.9.2.2	O	TV	6
9-	TMSI status	TMSI status 9.9.3.31	O	TV	1
11	Mobile station classmark 2	Mobile station classmark 2 9.9.2.4	O	TLV	5
20	Mobile station classmark 3	Mobile station classmark 3 9.9.2.5	O	TLV	2-34
40	Supported Codecs	Supported Codec List 9.9.2.10	O	TLV	5-n
F-	Additional update type	Additional update type 9.9.3.0B	O	TV	1
5D	Voice domain preference and UE's usage setting	Voice domain preference and UE's usage setting 9.9.3.44	O	TLV	3
D-	Device properties	Device properties 9.9.2.0A	O	TV	1
E-	Old GUTI type	GUTI type 9.9.3.45	O	TV	1
C-	MS network feature support	MS network feature support 9.9.3.20A	O	TV	1
10	TMSI based NRI container	Network resource identifier container 9.9.3.24A	O	TLV	4
6A	T3324 value	GPRS timer 2 9.9.3.16A	O	TLV	3
5E	T3412 extended value	GPRS timer 3 9.9.3.16B	O	TLV	3
6E	Extended DRX parameters	Extended DRX parameters 9.9.3.46	O	TLV	3
6F	UE additional security capability	UE additional security capability 9.9.3.53	O	TLV	6
6D	UE status	UE status 9.9.3.54	O	TLV	3
17	Additional information requested	Additional information requested 9.9.3.55	O	TV	2

Table 8.3.8.1: BEARER RESOURCE ALLOCATION REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length
	Protocol discriminator	Protocol discriminator 9.2	M	V	1/2
	EPS bearer identity	EPS bearer identity 9.3.2	M	V	1/2
	Procedure transaction identity	Procedure transaction identity 9.4	M	V	1
	Bearer resource allocation request message identity	Message type 9.8	M	V	1
	Linked EPS bearer identity	Linked EPS bearer identity 9.9.4.6	M	V	1/2
	Spare half octet	Spare half octet 9.9.2.9	M	V	1/2
	Traffic flow aggregate	Traffic flow aggregate description 9.9.4.15	M	LV	2-256
	Required traffic flow QoS	EPS quality of service 9.9.4.3	M	LV	2-14
27	Protocol configuration options	Protocol configuration options 9.9.4.11	O	TLV	3-253
C-	Device properties	Device properties 9.9.2.0A	O	TV	1
33	NBIFOM container	NBIFOM container 9.9.4.19	O	TLV	3-257
7B	Extended protocol configuration options	Extended protocol configuration options 9.9.4.26	O	TLV-E	4-65538
5C	Extended EPS QoS	Extended quality of service 9.9.4.30	O	TLV	12

Table 8.3.10.1: BEARER RESOURCE MODIFICATION REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length
	Protocol discriminator	Protocol discriminator 9.2	M	V	1/2
	EPS bearer identity	EPS bearer identity 9.3.2	M	V	1/2
	Procedure transaction identity	Procedure transaction identity 9.4	M	V	1
	Bearer resource modification request message identity	Message type 9.8	M	V	1
	EPS bearer identity for packet filter	Linked EPS bearer identity 9.9.4.6	M	V	1/2
	Spare half octet	Spare half octet 9.9.2.9	M	V	1/2
	Traffic flow aggregate	Traffic flow aggregate description 9.9.4.15	M	LV	2-256
5B	Required traffic flow QoS	EPS quality of service 9.9.4.3	O	TLV	3-15
58	ESM cause	ESM cause 9.9.4.4	O	TV	2
27	Protocol configuration options	Protocol configuration options 9.9.4.11	O	TLV	3-253
C-	Device properties	Device properties 9.9.2.0A	O	TV	1
33	NBIFOM container	NBIFOM container 9.9.4.19	O	TLV	3-257
66	Header compression configuration	Header compression configuration 9.9.4.22	O	TLV	5-257
7B	Extended protocol configuration options	Extended protocol configuration options 9.9.4.26	O	TLV-E	4-65538
5C	Extended EPS QoS	Extended quality of service 9.9.4.30	O	TLV	12

	Table 8.3.20.1: PDN CONNECTIVITY REQUEST message content 3GPP TS 24.301 v15.03
17. The method of claim 1, wherein the device service state comprises an agent report, a service usage record, a transaction record, or an integrity report.	The Accused Instrumentalities comprise receiving, over a service control link, a report from a wireless end-user device, the report comprising information about a device service state, wherein the device service state comprises an agent report, a service usage record, a transaction record, or an integrity report. *See, e.g.*:

IEI	Information Element	Type/Reference	Presence	Format	Length
	Protocol discriminator	Protocol discriminator 9.2	M	V	1/2
	EPS bearer identity	EPS bearer identity 9.3.2	M	V	1/2
	Procedure transaction identity	Procedure transaction identity 9.4	M	V	1
	PDN connectivity request message identity	Message type 9.8	M	V	1
	Request type	Request type 9.9.4.14	M	V	1/2
	PDN type	PDN type 9.9.4.10	M	V	1/2
D-	ESM information transfer flag	ESM information transfer flag 9.9.4.5	O	TV	1
28	Access point name	Access point name 9.9.4.1	O	TLV	3-102
27	Protocol configuration options	Protocol configuration options 9.9.4.11	O	TLV	3-253
C-	Device properties	Device properties 9.9.2.0A	O	TV	1
33	NBIFOM container	NBIFOM container 9.9.4.19	O	TLV	3-257
66	Header compression configuration	Header compression configuration 9.9.4.22	O	TLV	5-257
7B	Extended protocol configuration options	Extended protocol configuration options 9.9.4.26	O	TLV-E	4-65538

Table 8.2.4.1: ATTACH REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length
	Protocol discriminator	Protocol discriminator 9.2	M	V	1/2
	Security header type	Security header type 9.3.1	M	V	1/2
	Attach request message identity	Message type 9.8	M	V	1
	EPS attach type	EPS attach type 9.9.3.11	M	V	1/2
	NAS key set identifier	NAS key set identifier 9.9.3.21	M	V	1/2
	EPS mobile identity	EPS mobile identity 9.9.3.12	M	LV	5-12
	UE network capability	UE network capability 9.9.3.34	M	LV	3-14
	ESM message container	ESM message container 9.9.3.15	M	LV-E	5-n
19	Old P-TMSI signature	P-TMSI signature 9.9.3.26	O	TV	4
50	Additional GUTI	EPS mobile identity 9.9.3.12	O	TLV	13
52	Last visited registered TAI	Tracking area identity 9.9.3.32	O	TV	6
5C	DRX parameter	DRX parameter 9.9.3.8	O	TV	3
31	MS network capability	MS network capability 9.9.3.20	O	TLV	4-10
13	Old location area identification	Location area identification 9.9.2.2	O	TV	6
9-	TMSI status	TMSI status 9.9.3.31	O	TV	1
11	Mobile station classmark 2	Mobile station classmark 2 9.9.2.4	O	TLV	5
20	Mobile station classmark 3	Mobile station classmark 3 9.9.2.5	O	TLV	2-34
40	Supported Codecs	Supported Codec List 9.9.2.10	O	TLV	5-n
F-	Additional update type	Additional update type 9.9.3.0B	O	TV	1
5D	Voice domain preference and UE's usage setting	Voice domain preference and UE's usage setting 9.9.3.44	O	TLV	3
D-	Device properties	Device properties 9.9.2.0A	O	TV	1
E-	Old GUTI type	GUTI type 9.9.3.45	O	TV	1
C-	MS network feature support	MS network feature support 9.9.3.20A	O	TV	1
10	TMSI based NRI container	Network resource identifier container 9.9.3.24A	O	TLV	4
6A	T3324 value	GPRS timer 2 9.9.3.16A	O	TLV	3
5E	T3412 extended value	GPRS timer 3 9.9.3.16B	O	TLV	3
6E	Extended DRX parameters	Extended DRX parameters 9.9.3.46	O	TLV	3
6F	UE additional security capability	UE additional security capability 9.9.3.53	O	TLV	6
6D	UE status	UE status 9.9.3.54	O	TLV	3
17	Additional information requested	Additional information requested 9.9.3.55	O	TV	2

Table 8.3.8.1: BEARER RESOURCE ALLOCATION REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length
	Protocol discriminator	Protocol discriminator 9.2	M	V	1/2
	EPS bearer identity	EPS bearer identity 9.3.2	M	V	1/2
	Procedure transaction identity	Procedure transaction identity 9.4	M	V	1
	Bearer resource allocation request message identity	Message type 9.8	M	V	1
	Linked EPS bearer identity	Linked EPS bearer identity 9.9.4.6	M	V	1/2
	Spare half octet	Spare half octet 9.9.2.9	M	V	1/2
	Traffic flow aggregate	Traffic flow aggregate description 9.9.4.15	M	LV	2-256
	Required traffic flow QoS	EPS quality of service 9.9.4.3	M	LV	2-14
27	Protocol configuration options	Protocol configuration options 9.9.4.11	O	TLV	3-253
C-	Device properties	Device properties 9.9.2.0A	O	TV	1
33	NBIFOM container	NBIFOM container 9.9.4.19	O	TLV	3-257
7B	Extended protocol configuration options	Extended protocol configuration options 9.9.4.26	O	TLV-E	4-65538
5C	Extended EPS QoS	Extended quality of service 9.9.4.30	O	TLV	12

Table 8.3.10.1: BEARER RESOURCE MODIFICATION REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length
	Protocol discriminator	Protocol discriminator 9.2	M	V	1/2
	EPS bearer identity	EPS bearer identity 9.3.2	M	V	1/2
	Procedure transaction identity	Procedure transaction identity 9.4	M	V	1
	Bearer resource modification request message identity	Message type 9.8	M	V	1
	EPS bearer identity for packet filter	Linked EPS bearer identity 9.9.4.6	M	V	1/2
	Spare half octet	Spare half octet 9.9.2.9	M	V	1/2
	Traffic flow aggregate	Traffic flow aggregate description 9.9.4.15	M	LV	2-256
5B	Required traffic flow QoS	EPS quality of service 9.9.4.3	O	TLV	3-15
58	ESM cause	ESM cause 9.9.4.4	O	TV	2
27	Protocol configuration options	Protocol configuration options 9.9.4.11	O	TLV	3-253
C-	Device properties	Device properties 9.9.2.0A	O	TV	1
33	NBIFOM container	NBIFOM container 9.9.4.19	O	TLV	3-257
66	Header compression configuration	Header compression configuration 9.9.4.22	O	TLV	5-257
7B	Extended protocol configuration options	Extended protocol configuration options 9.9.4.26	O	TLV-E	4-65538
5C	Extended EPS QoS	Extended quality of service 9.9.4.30	O	TLV	12

	Table 8.3.20.1: PDN CONNECTIVITY REQUEST message content 3GPP TS 24.301 v15.03
18. The method of claim 1, wherein the device service state comprises user status information, device status information, application status information, a device location, or a device quality-of-service (QOS) state.	The Accused Instrumentalities comprise receiving, over a service control link, a report from a wireless end-user device, the report comprising information about a device service state, wherein the device service state comprises user status information, device status information, application status information, a device location, or a device quality-of-service (QOS) state. *See, e.g.*:

IEI	Information Element	Type/Reference	Presence	Format	Length
	Protocol discriminator	Protocol discriminator 9.2	M	V	1/2
	EPS bearer identity	EPS bearer identity 9.3.2	M	V	1/2
	Procedure transaction identity	Procedure transaction identity 9.4	M	V	1
	PDN connectivity request message identity	Message type 9.8	M	V	1
	Request type	Request type 9.9.4.14	M	V	1/2
	PDN type	PDN type 9.9.4.10	M	V	1/2
D-	ESM information transfer flag	ESM information transfer flag 9.9.4.5	O	TV	1
28	Access point name	Access point name 9.9.4.1	O	TLV	3-102
27	Protocol configuration options	Protocol configuration options 9.9.4.11	O	TLV	3-253
C-	Device properties	Device properties 9.9.2.0A	O	TV	1
33	NBIFOM container	NBIFOM container 9.9.4.19	O	TLV	3-257
66	Header compression configuration	Header compression configuration 9.9.4.22	O	TLV	5-257
7B	Extended protocol configuration options	Extended protocol configuration options 9.9.4.26	O	TLV-E	4-65538

Table 8.2.4.1: ATTACH REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length
	Protocol discriminator	Protocol discriminator 9.2	M	V	1/2
	Security header type	Security header type 9.3.1	M	V	1/2
	Attach request message identity	Message type 9.8	M	V	1
	EPS attach type	EPS attach type 9.9.3.11	M	V	1/2
	NAS key set identifier	NAS key set identifier 9.9.3.21	M	V	1/2
	EPS mobile identity	EPS mobile identity 9.9.3.12	M	LV	5-12
	UE network capability	UE network capability 9.9.3.34	M	LV	3-14
	ESM message container	ESM message container 9.9.3.15	M	LV-E	5-n
19	Old P-TMSI signature	P-TMSI signature 9.9.3.26	O	TV	4
50	Additional GUTI	EPS mobile identity 9.9.3.12	O	TLV	13
52	Last visited registered TAI	Tracking area identity 9.9.3.32	O	TV	6
5C	DRX parameter	DRX parameter 9.9.3.8	O	TV	3
31	MS network capability	MS network capability 9.9.3.20	O	TLV	4-10
13	Old location area identification	Location area identification 9.9.2.2	O	TV	6
9-	TMSI status	TMSI status 9.9.3.31	O	TV	1
11	Mobile station classmark 2	Mobile station classmark 2 9.9.2.4	O	TLV	5
20	Mobile station classmark 3	Mobile station classmark 3 9.9.2.5	O	TLV	2-34
40	Supported Codecs	Supported Codec List 9.9.2.10	O	TLV	5-n
F-	Additional update type	Additional update type 9.9.3.0B	O	TV	1
5D	Voice domain preference and UE's usage setting	Voice domain preference and UE's usage setting 9.9.3.44	O	TLV	3
D-	Device properties	Device properties 9.9.2.0A	O	TV	1
E-	Old GUTI type	GUTI type 9.9.3.45	O	TV	1
C-	MS network feature support	MS network feature support 9.9.3.20A	O	TV	1
10	TMSI based NRI container	Network resource identifier container 9.9.3.24A	O	TLV	4
6A	T3324 value	GPRS timer 2 9.9.3.16A	O	TLV	3
5E	T3412 extended value	GPRS timer 3 9.9.3.16B	O	TLV	3
6E	Extended DRX parameters	Extended DRX parameters 9.9.3.46	O	TLV	3
6F	UE additional security capability	UE additional security capability 9.9.3.53	O	TLV	6
6D	UE status	UE status 9.9.3.54	O	TLV	3
17	Additional information requested	Additional information requested 9.9.3.55	O	TV	2

Table 8.3.8.1: BEARER RESOURCE ALLOCATION REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length
	Protocol discriminator	Protocol discriminator 9.2	M	V	1/2
	EPS bearer identity	EPS bearer identity 9.3.2	M	V	1/2
	Procedure transaction identity	Procedure transaction identity 9.4	M	V	1
	Bearer resource allocation request message identity	Message type 9.8	M	V	1
	Linked EPS bearer identity	Linked EPS bearer identity 9.9.4.6	M	V	1/2
	Spare half octet	Spare half octet 9.9.2.9	M	V	1/2
	Traffic flow aggregate	Traffic flow aggregate description 9.9.4.15	M	LV	2-256
	Required traffic flow QoS	EPS quality of service 9.9.4.3	M	LV	2-14
27	Protocol configuration options	Protocol configuration options 9.9.4.11	O	TLV	3-253
C-	Device properties	Device properties 9.9.2.0A	O	TV	1
33	NBIFOM container	NBIFOM container 9.9.4.19	O	TLV	3-257
7B	Extended protocol configuration options	Extended protocol configuration options 9.9.4.26	O	TLV-E	4-65538
5C	Extended EPS QoS	Extended quality of service 9.9.4.30	O	TLV	12

Table 8.3.10.1: BEARER RESOURCE MODIFICATION REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length
	Protocol discriminator	Protocol discriminator 9.2	M	V	1/2
	EPS bearer identity	EPS bearer identity 9.3.2	M	V	1/2
	Procedure transaction identity	Procedure transaction identity 9.4	M	V	1
	Bearer resource modification request message identity	Message type 9.8	M	V	1
	EPS bearer identity for packet filter	Linked EPS bearer identity 9.9.4.6	M	V	1/2
	Spare half octet	Spare half octet 9.9.2.9	M	V	1/2
	Traffic flow aggregate	Traffic flow aggregate description 9.9.4.15	M	LV	2-256
5B	Required traffic flow QoS	EPS quality of service 9.9.4.3	O	TLV	3-15
58	ESM cause	ESM cause 9.9.4.4	O	TV	2
27	Protocol configuration options	Protocol configuration options 9.9.4.11	O	TLV	3-253
C-	Device properties	Device properties 9.9.2.0A	O	TV	1
33	NBIFOM container	NBIFOM container 9.9.4.19	O	TLV	3-257
66	Header compression configuration	Header compression configuration 9.9.4.22	O	TLV	5-257
7B	Extended protocol configuration options	Extended protocol configuration options 9.9.4.26	O	TLV-E	4-65538
5C	Extended EPS QoS	Extended quality of service 9.9.4.30	O	TLV	12

Table 8.3.20.1: PDN CONNECTIVITY REQUEST message content

IEI	Information Element	Type/Reference	Presence	Format	Length
	Protocol discriminator	Protocol discriminator 9.2	M	V	1/2
	EPS bearer identity	EPS bearer identity 9.3.2	M	V	1/2
	Procedure transaction identity	Procedure transaction identity 9.4	M	V	1
	PDN connectivity request message identity	Message type 9.8	M	V	1
	Request type	Request type 9.9.4.14	M	V	1/2
	PDN type	PDN type 9.9.4.10	M	V	1/2
D-	ESM information transfer flag	ESM information transfer flag 9.9.4.5	O	TV	1
28	Access point name	Access point name 9.9.4.1	O	TLV	3-102
27	Protocol configuration options	Protocol configuration options 9.9.4.11	O	TLV	3-253
C-	Device properties	Device properties 9.9.2.0A	O	TV	1
33	NBIFOM container	NBIFOM container 9.9.4.19	O	TLV	3-257
66	Header compression configuration	Header compression configuration 9.9.4.22	O	TLV	5-257
7B	Extended protocol configuration options	Extended protocol configuration options 9.9.4.26	O	TLV-E	4-65538

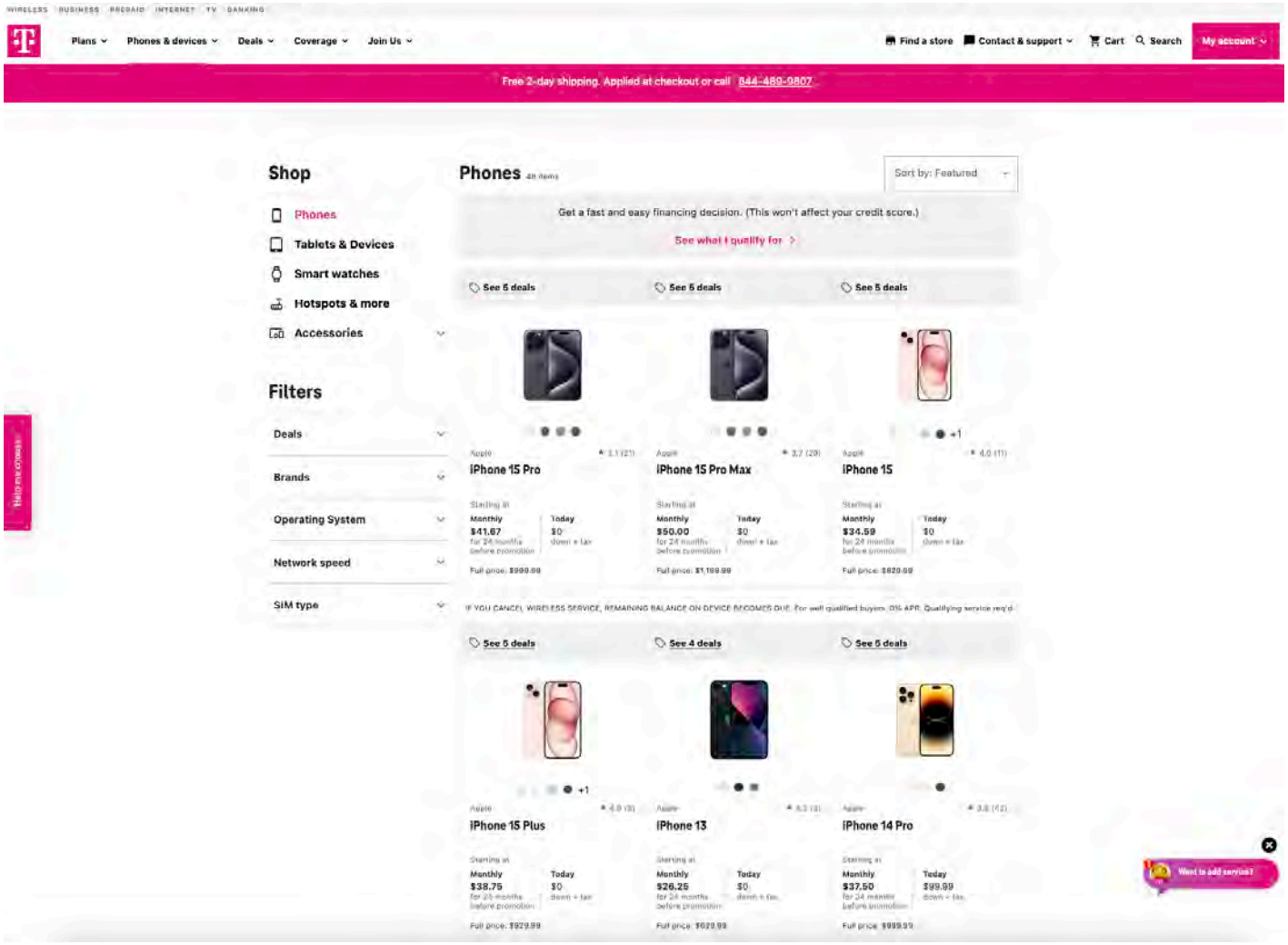
3GPP TS 24.301 v15.03

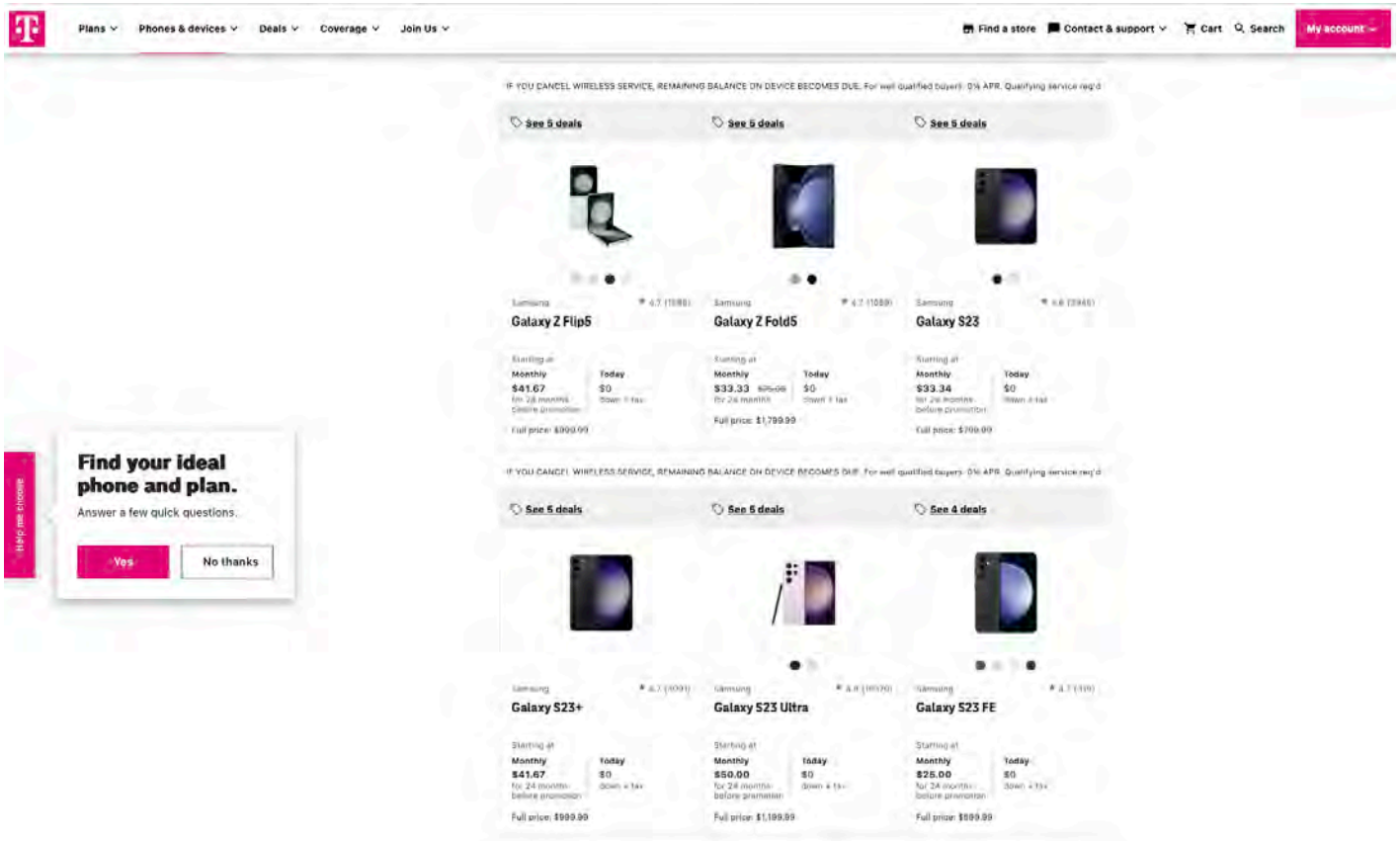
Exhibit D - U.S. Patent No. 9,215,613 ("'613 Patent")

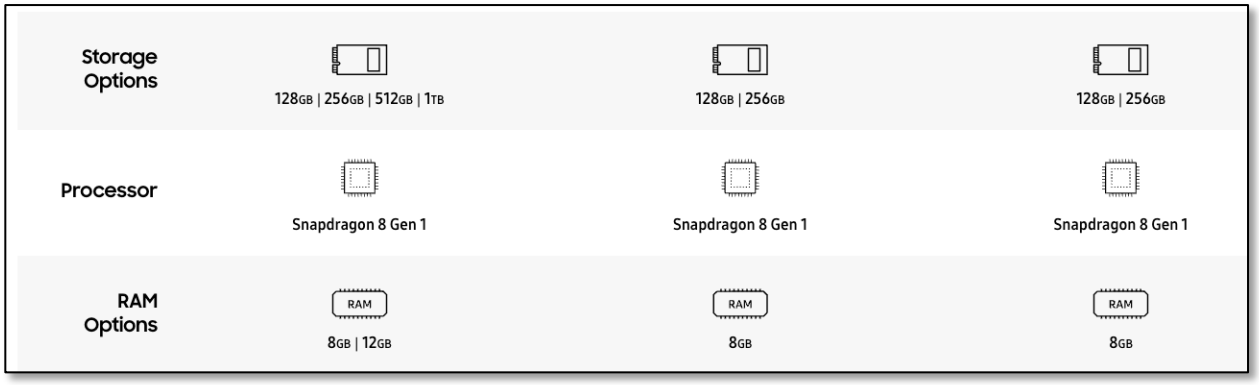
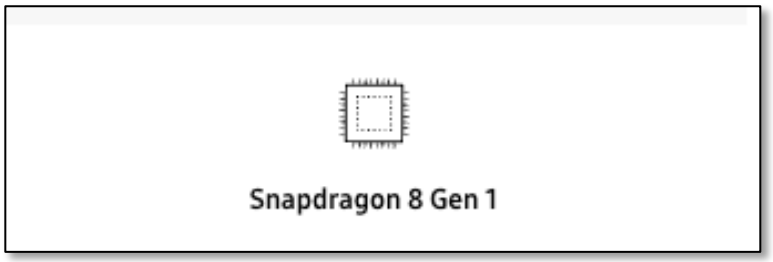
Accused Instrumentalities: smartphones, basic phones, tablets, laptops, and hotspot devices sold (including those sold in bundles with data plans) or used by T-Mobile and all versions and variations thereof ("Accused Instrumentalities") since the issuance of U.S. Pat. No. 9,215,613 (the "Asserted Patent").

Claim 1

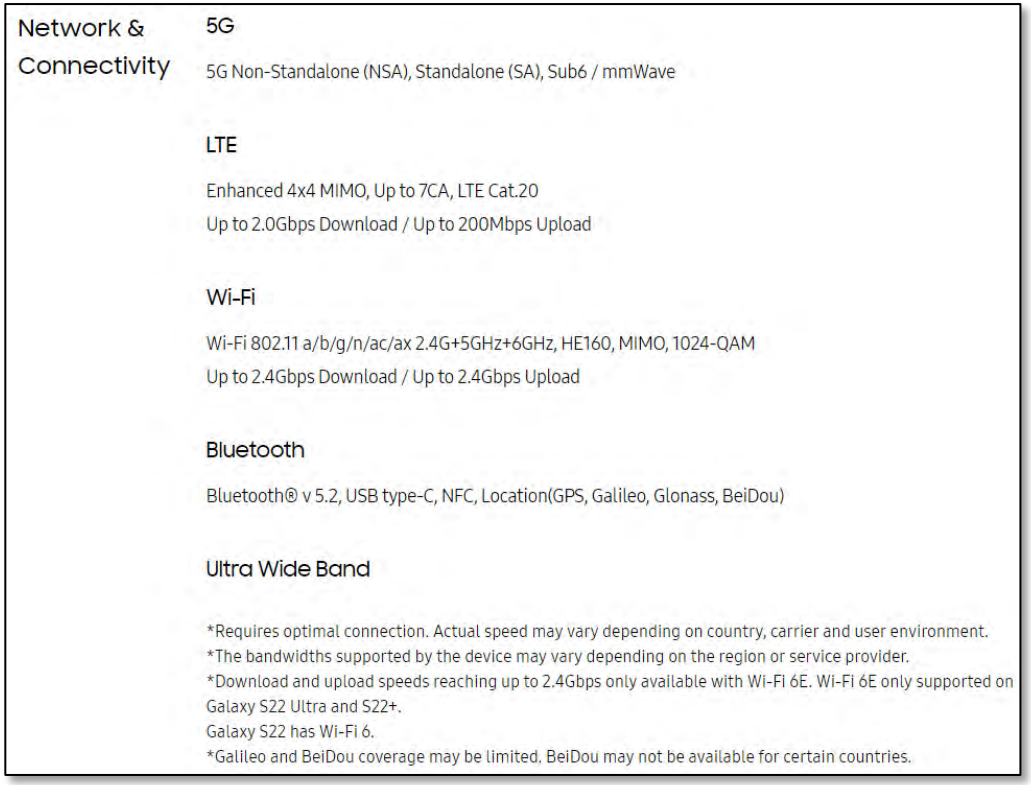
Claim	Public Documentation
[1pre] A wireless end-user device, comprising:	The Accused Instrumentalities include "A wireless end-user device, comprising." For example, T-Mobile sells and uses devices described by T-Mobile's website below (e.g., devices made by Samsung, Apple, Motorola, Google, and Kyocera). These devices constitute a wireless end-user device as described in claim 1. *See, e.g.* https://www.t-mobile.com/cell-phones

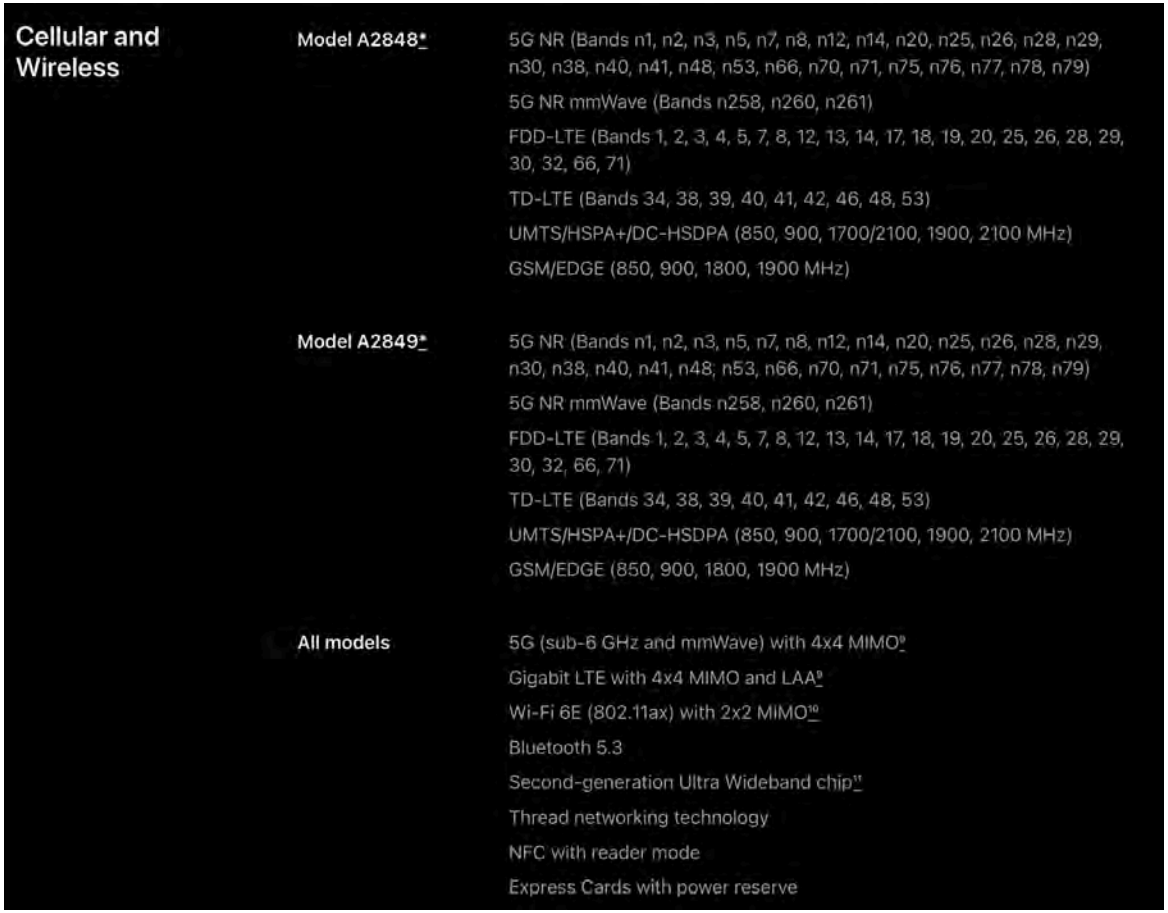
Claim	Public Documentation
	

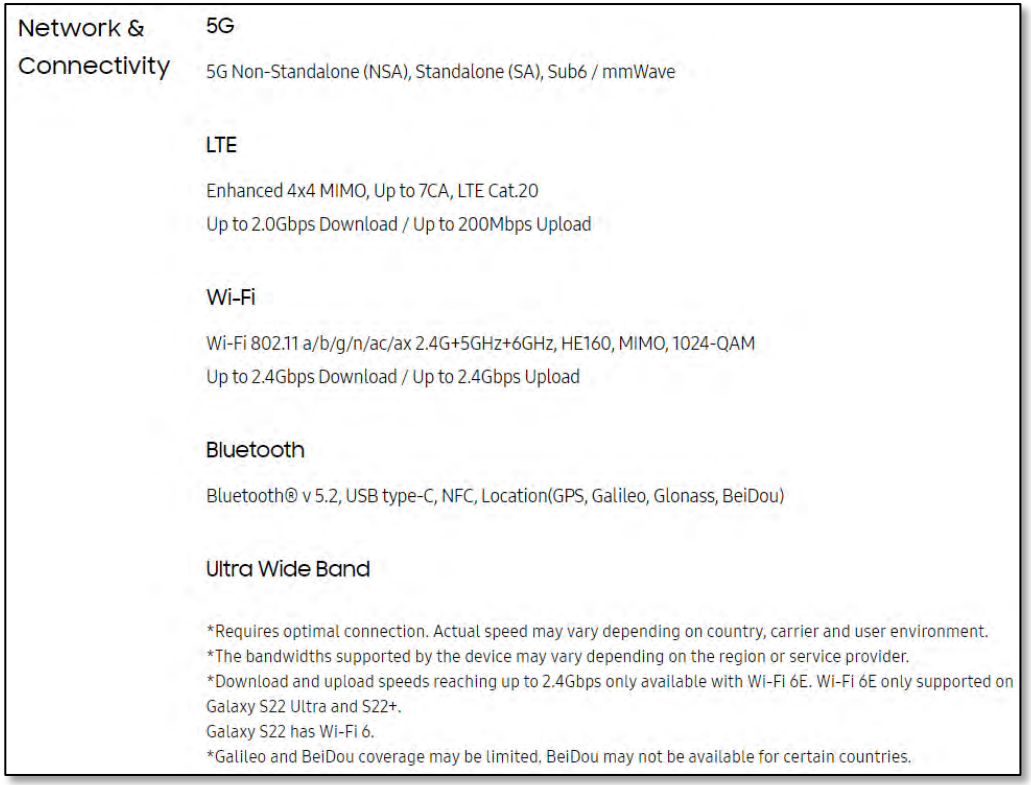
Claim	Public Documentation
	 ; *see also* https://www.t-mobile.com/tablets; https://www.t-mobile.com/smart-watches; https://www.t-mobile.com/hotspots-iot-connected-devices. For further example, the Samsung Galaxy S22 model is sold or used by T-Mobile and includes 8GB RAM and either 128GB or 256GB non-removable memory storage, in which control policies for applications are stored. *See, e.g.*, https://www.samsung.com/us/smartphones/galaxy-s22/buy/galaxy-s22-128gb-unlocked-sm-s901uz-kaxaa/:

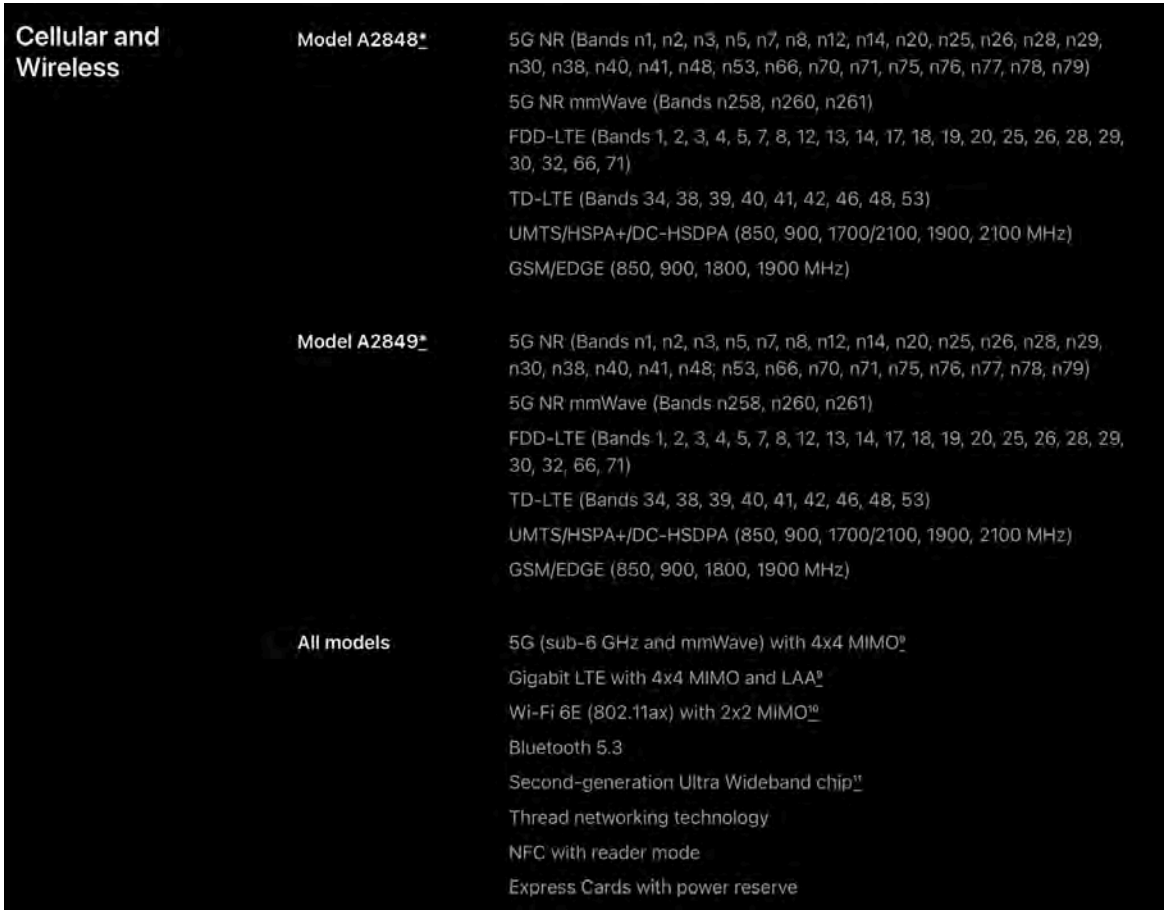
Claim	Public Documentation
	 For further example, the Galaxy S22 has either a Snapdragon (in the United States) or Exynos (in Korea) architecture-based application processor. *See, e.g.*, https://www.samsung.com/us/smartphones/galaxy-s22/buy/galaxy-s22-128gb-unlocked-sm-s901uzkaxaa/:  For further example, the Apple iPhone 15 Pro model is sold or used by T-Mobile and includes 128GB, 256GB, 512GB, or 1TB of memory storage, in which control policies for applications are stored. *See, e.g.*, https://www.apple.com/iphone-15-pro/specs/:

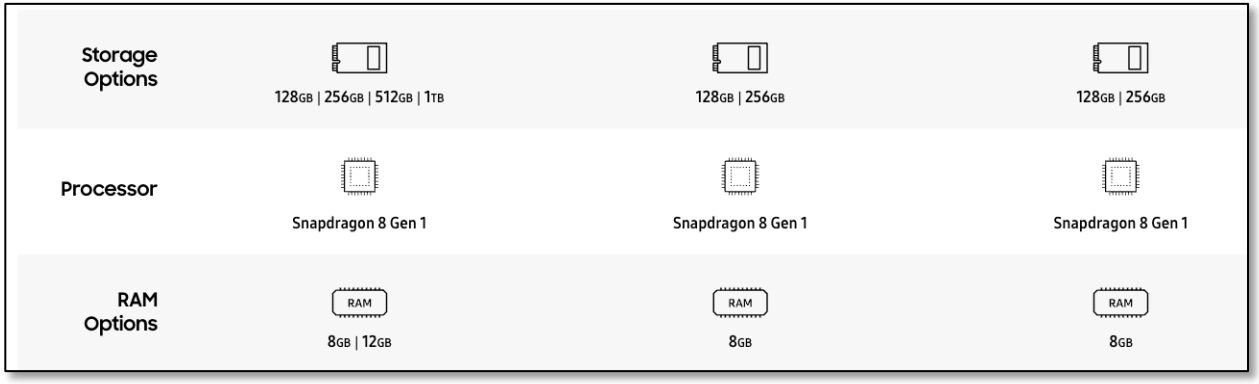
Claim	Public Documentation
	 For further example, the Apple iPhone 15 Pro model has a A17 Pro Chip. *See, e.g.*, https://www.apple.com/iphone-15-pro/specs/
[1a] a wireless wide area network (WWAN) modem to communicate data for Internet service activities between the device and at least one WWAN, when configured for and connected to the WWAN;	The Accused Instrumentalities include "a wireless wide area network (WWAN) modem to communicate data for Internet service activities between the device and at least one WWAN, when configured for and connected to the WWAN." This WWAN modem in the Accused Instrumentalities provides a connection to a T-Mobile's wireless network. For example, Samsung Galaxy phones and tablets comprise a wireless modem for communicating with mobile service base stations. *See, e.g.*, https://www.samsung.com/us/smartphones/galaxy-s22/models/:

Claim	Public Documentation
	 For further example, the Apple iPhone 15 Pro model is sold or used by T-Mobile and comprise a wireless modem for communicating with mobile service base stations. *See, e.g.*, https://www.apple.com/iphone-15-pro/specs/:

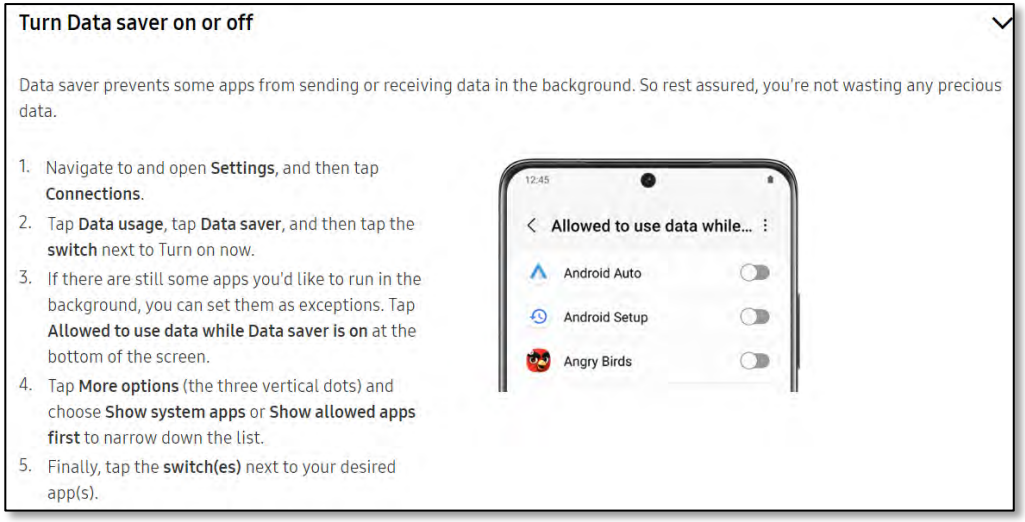
Claim	Public Documentation
	
[1b] a wireless local area network (WLAN) modem to communicate data for Internet service activities between the device and at least one WLAN, when configured for and connected to the WLAN;	The Accused Instrumentalities include "a wireless local area network (WLAN) modem to communicate data for Internet service activities between the device and at least one WLAN, when configured for and connected to the WLAN." For example, Samsung Galaxy phones and tablets comprise a wi-fi modem for communicating over a wi-fi networks. *See, e.g.*, https://www.samsung.com/us/smartphones/galaxy-s22/models/:

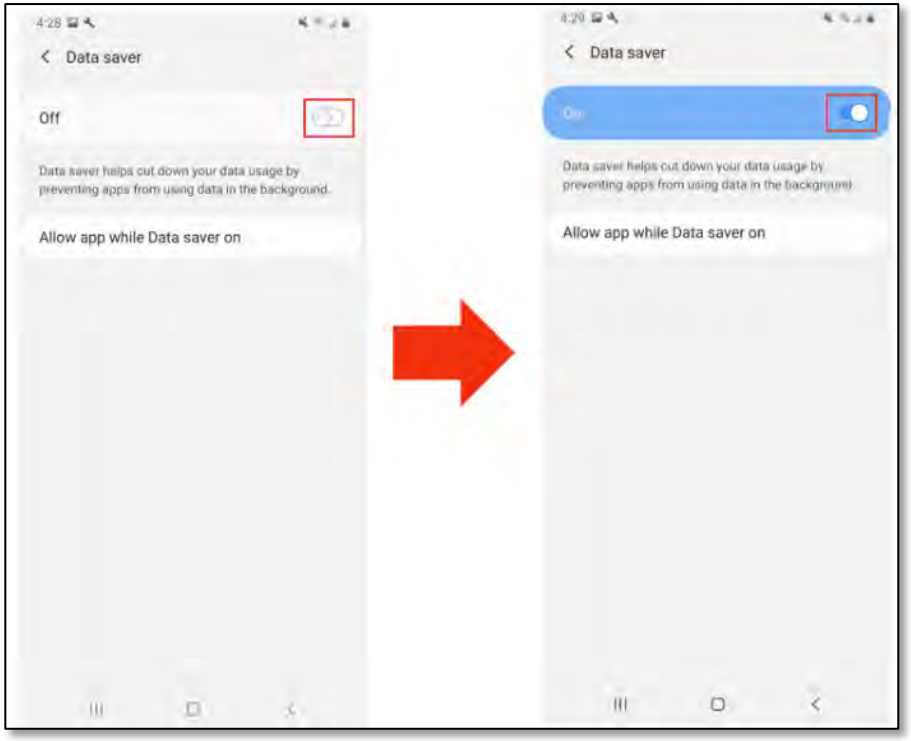
Claim	Public Documentation
	 For further example, the Apple iPhone 15 Pro model is sold or used by T-Mobile and comprises a wi-fi modem for communicating over a wi-fi networks. *See, e.g.*, https://www.apple.com/iphone-15-pro/specs/:

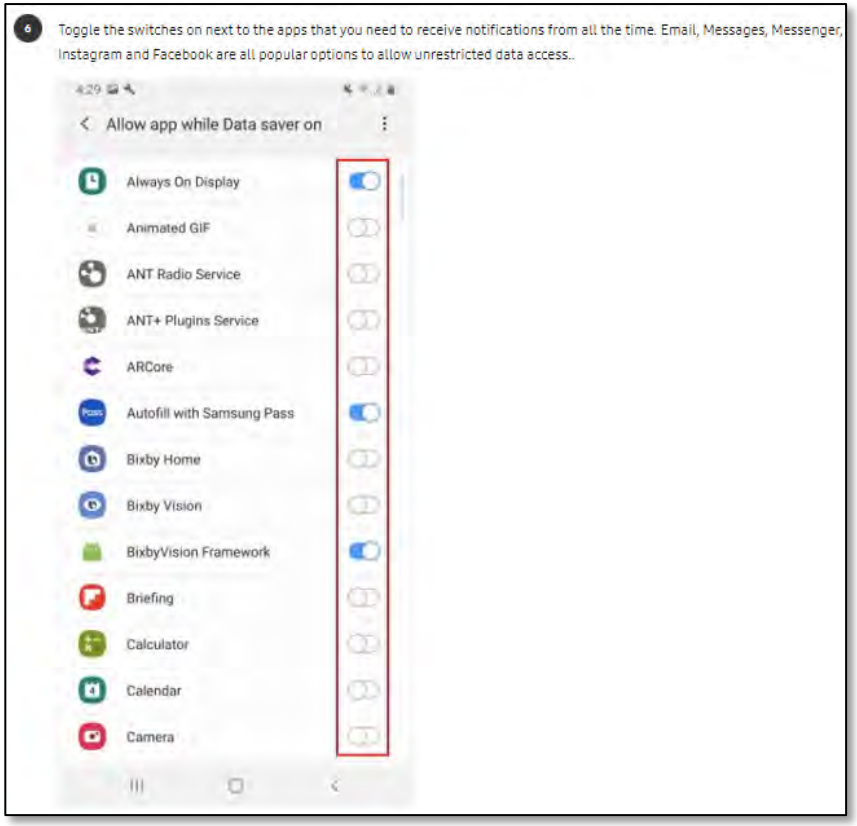
Claim	Public Documentation
	

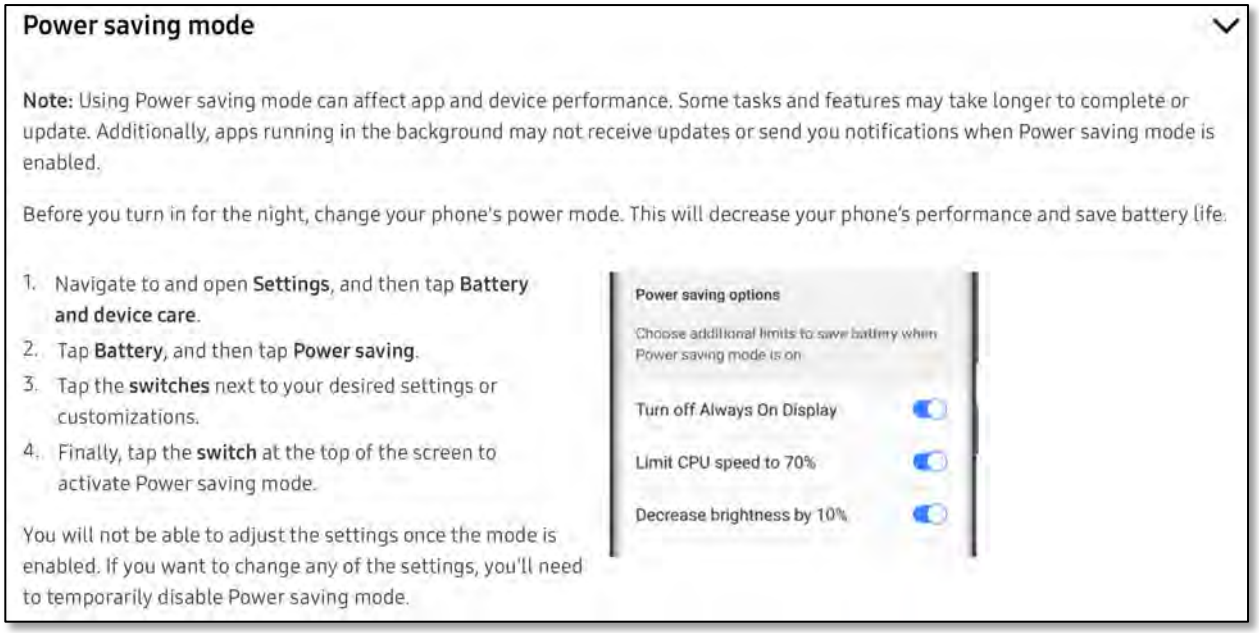
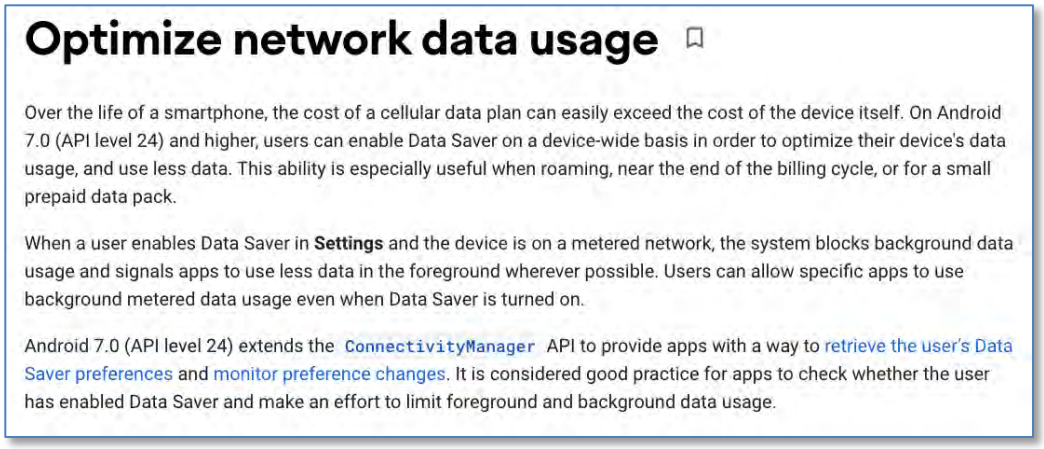
Claim	Public Documentation
[1c] a non-transient memory to store	The Accused Instrumentalities include "a non-transient memory to store." For example, the Galaxy S22 model is sold with 8GB RAM and either 128GB or 256GB non-removable memory storage, in which control policies for applications are stored. *See, e.g.*, https://www.samsung.com/us/smartphones/galaxy-s22/buy/galaxy-s22-128gb-unlocked-sm-s901uzkaxaa/:  For further example, the Apple iPhone 15 Pro model is sold or used by T-Mobile and includes 128GB, 256GB, 512GB, or 1TB of memory storage, in which control policies for applications are stored. *See, e.g.*, https://www.apple.com/iphone-15-pro/specs/:

Claim	Public Documentation
[1d] a differential traffic control policy list distinguishing between a first one or more applications resident on the device and a second one or more applications and/or services resident on the device, and	The Accused Instrumentalities comprise "a differential traffic control policy list distinguishing between a first one or more applications resident on the device and a second one or more applications and/or services resident on the device." For example, Samsung's "Data Saver," or "Power Saver," "Doze Mode," "App Standby," "Adaptive Battery," and/or "JobScheduler" features include policies which distinguish between applications and/or services. *See, e.g.*, https://www.t-mobile.com/support/public-files/attachments/samsung/samsung-galaxy-s21-fe-5g/Samsung%20Galaxy%20S21%20FE%205G_English%20User%20Guide_FINAL2.pdf: Data usage Check your current mobile and Wi-Fi data usage. You can also customize warnings and limits. ○ From Settings, tap Connections > Data usage. Turn on Data saver Use Data saver to reduce your data consumption by preventing selected apps from sending or receiving data in the background. 1. From Settings, tap Connections > Data usage > Data saver. 2. Tap to turn on Data saver. • To allow some apps to have unrestricted data usage, tap Allowed to use data while Data saver is on, and tap next to each app to specify restrictions. ; https://www.samsung.com/us/support/answer/ANS00079018/:

Claim	Public Documentation
	 ; https://www.samsung.com/ae/support/mobile-devices/android-pie-what-is-the-data-saver-feature/:

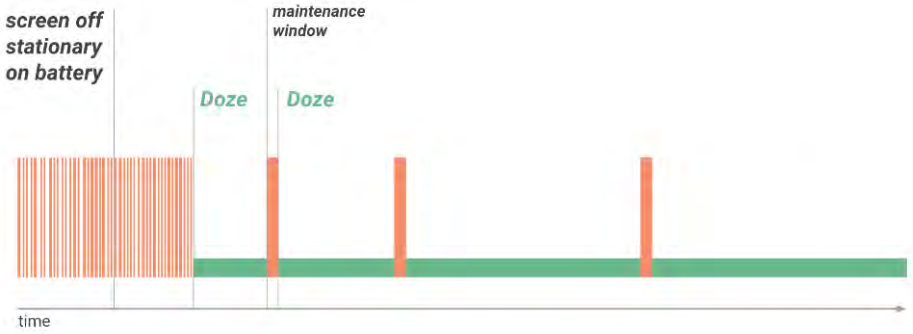
Claim	Public Documentation
	

Claim	Public Documentation
	 ; https://www.samsung.com/us/support/answer/ANS00078987/:

Claim	Public Documentation
	 ; https://developer.android.com/training/basics/network-ops/data-saver: 

Claim	Public Documentation

	Check data saver preferences
	
	On Android 7.0 (API level 24) and higher, apps can use the `ConnectivityManager` API to determine what data usage restrictions are being applied. The `getRestrictBackgroundStatus()` method returns one of the following values:
	
	`RESTRICT_BACKGROUND_STATUS_DISABLED`
	Data Saver is disabled.
	
	`RESTRICT_BACKGROUND_STATUS_ENABLED`
	The user has enabled Data Saver for this app. Apps should make an effort to limit data usage in the foreground and gracefully handle restrictions to background data usage.
	
	`RESTRICT_BACKGROUND_STATUS_WHITELISTED`
	The user has enabled Data Saver but the app is allowed to bypass it. Apps should still make an effort to limit foreground and background data usage.
	
	Limit data usage whenever the device is connected to a metered network, even if Data Saver is disabled or the app is allowed to bypass it. The following sample code uses `ConnectivityManager.isActiveNetworkMetered()` and `ConnectivityManager.getRestrictBackgroundStatus()` to determine how much data the app should use:
	
	; https://developer.android.com/training/monitoring-device-state/doze-standby:
	
	Optimize for Doze and App Standby
	
	Starting from Android 6.0 (API level 23), Android introduces two power-saving features that extend battery life for users by managing how apps behave when a device is not connected to a power source. *Doze* reduces battery consumption by deferring background CPU and network activity for apps when the device is unused for long periods of time. *App Standby* defers background network activity for apps with which the user has not recently interacted.
	
	While the device is in Doze, apps' access to certain battery-intensive resources is deferred until maintenance windows. The specific restrictions are listed in Power Management Restrictions.
	
	Doze and App Standby manage the behavior of all apps running on Android 6.0 or higher, regardless whether they are specifically targeting API level 23. To ensure the best experience for users, test your app in Doze and App Standby modes and make any necessary adjustments to your code. The sections below provide details.

Claim	Public Documentation
	Understanding Doze If a user leaves a device unplugged and stationary for a period of time, with the screen off, the device enters Doze mode. In Doze mode, the system attempts to conserve battery by restricting apps' access to network and CPU-intensive services. It also prevents apps from accessing the network and defers their jobs, syncs, and standard alarms. Periodically, the system exits Doze for a brief time to let apps complete their deferred activities. During this *maintenance window*, the system runs all pending syncs, jobs, and alarms, and lets apps access the network.  **Figure 1.** Doze provides a recurring maintenance window for apps to use the network and handle pending activities. At the conclusion of each maintenance window, the system again enters Doze, suspending network access and deferring jobs, syncs, and alarms. Over time, the system schedules maintenance windows less and less frequently, helping to reduce battery consumption in cases of longer-term inactivity when the device is not connected to a charger. As soon as the user wakes the device by moving it, turning on the screen, or connecting a charger, the system exits Doze and all apps return to normal activity. The Doze restriction on network access is also likely to affect your app, especially if the app relies on real-time messages such as tickles or notifications. If your app requires a persistent connection to the network to receive messages, you should use Firebase Cloud Messaging (FCM) if possible. ; https://developer.android.com/topic/performance/appstandby:

App Standby Buckets

Android 9 (API level 28) and higher support **App Standby Buckets**. App Standby Buckets help the system prioritize apps' requests for resources based on how recently and how frequently the apps are used. Based on app usage patterns, each app is placed in one of five priority **buckets**. The system limits the device resources available to each app based on which bucket the app is in.

Priority buckets

The system dynamically assigns each app to a priority bucket, reassigning the apps as needed. The system may rely on a preloaded app that uses machine learning to determine how likely each app is to be used, and assigns apps to the appropriate buckets. If the system app is not present on a device, the system defaults to sorting apps based on how recently they were used. More active apps are assigned to buckets that give the apps higher priority, making more system resources available to the app. In particular, the bucket determines how frequently the app's jobs run, and how often the app can trigger alarms. These restrictions apply only while the device is on battery power; the system does not impose these restrictions on apps while the device is charging.

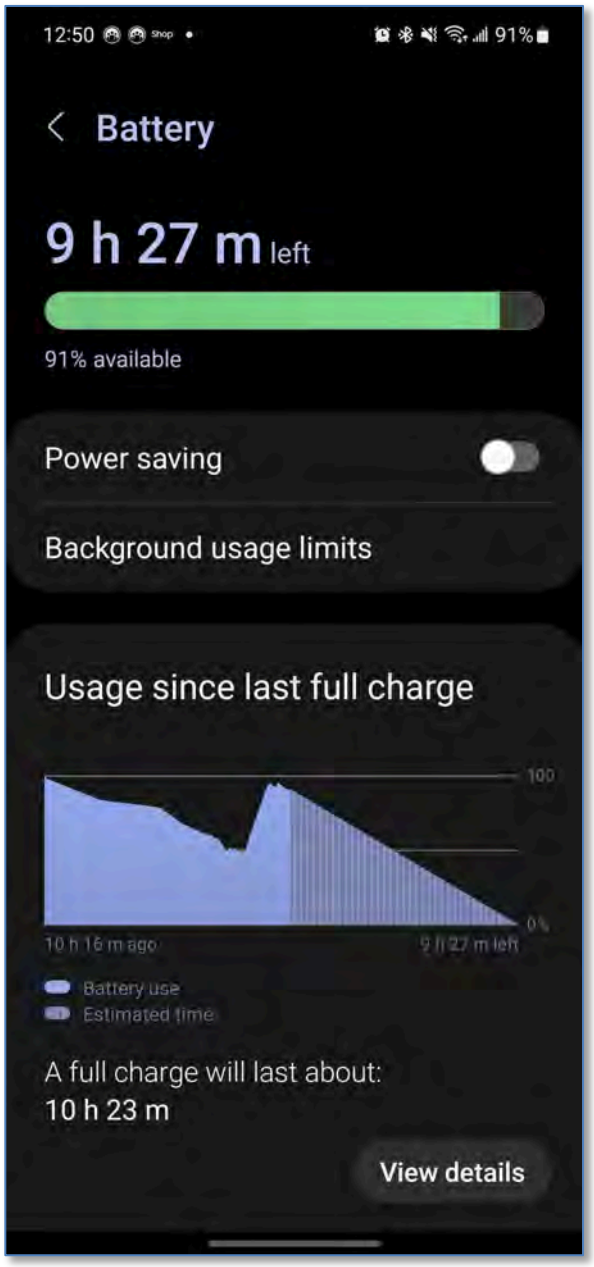
Note: Every manufacturer can set their own criteria for how non-active apps are assigned to buckets. You should not try to influence which bucket your app is assigned to. Instead, focus on making sure your app behaves well in whatever bucket it might be in. Your app can find out what bucket it's currently in by calling `UsageStatsManager.getAppStandbyBucket()`.

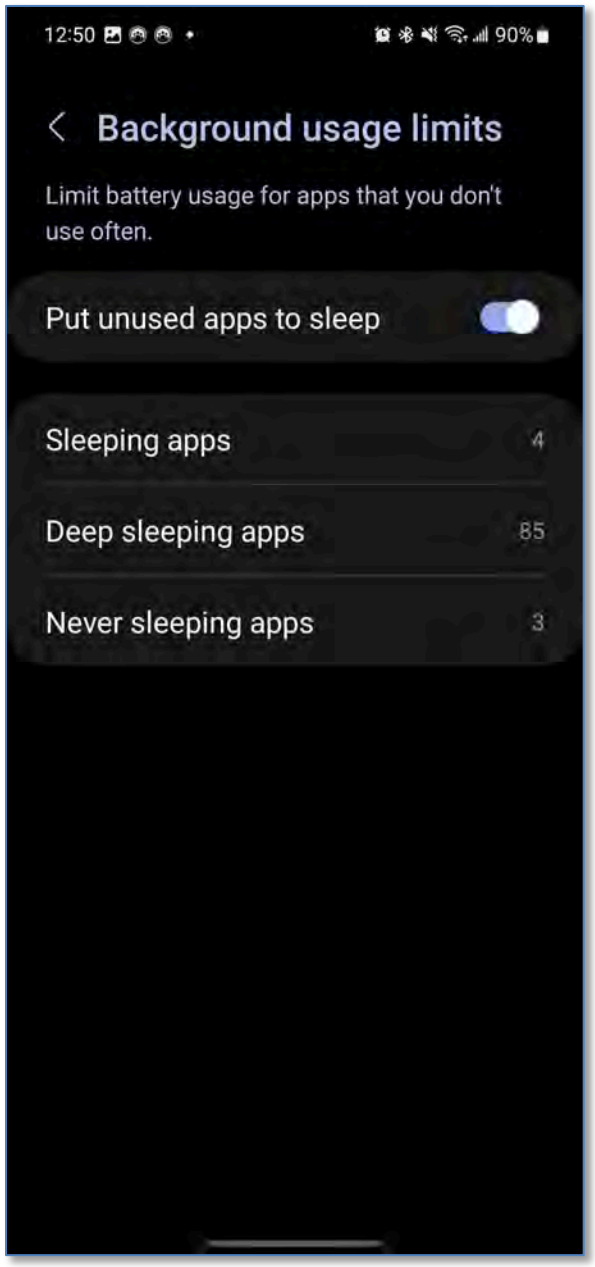
The buckets are:

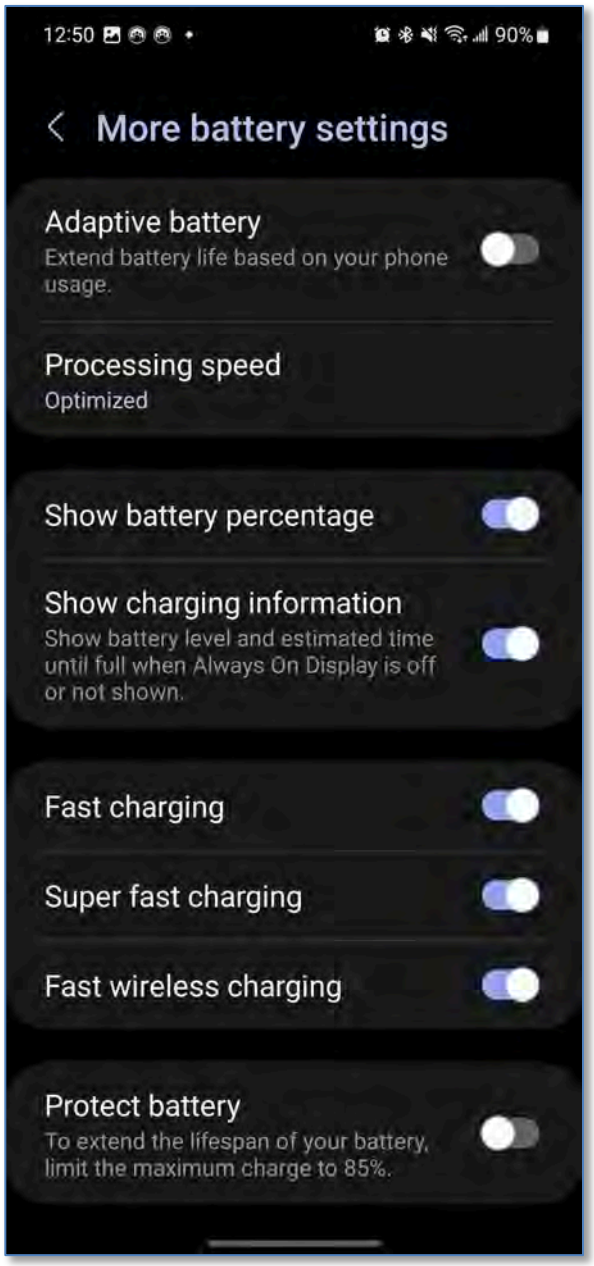
1. Active: App is currently being used or was very recently used.
2. Working set: App is in regular use.
3. Frequent: App is often used, but not every day.
4. Rare: App is not frequently used.
5. Restricted: App consumes a great deal of system resources, or may exhibit undesirable behavior.

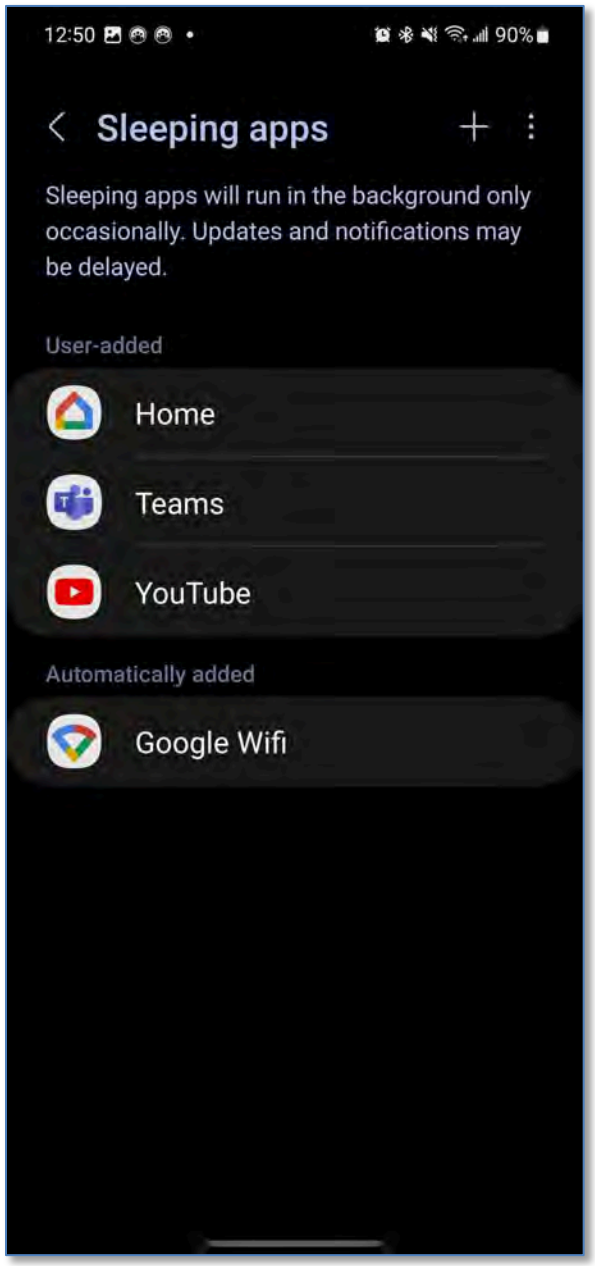
In addition, there's a special **never** bucket for apps that have been installed but have never been run. The system imposes severe restrictions on these apps.

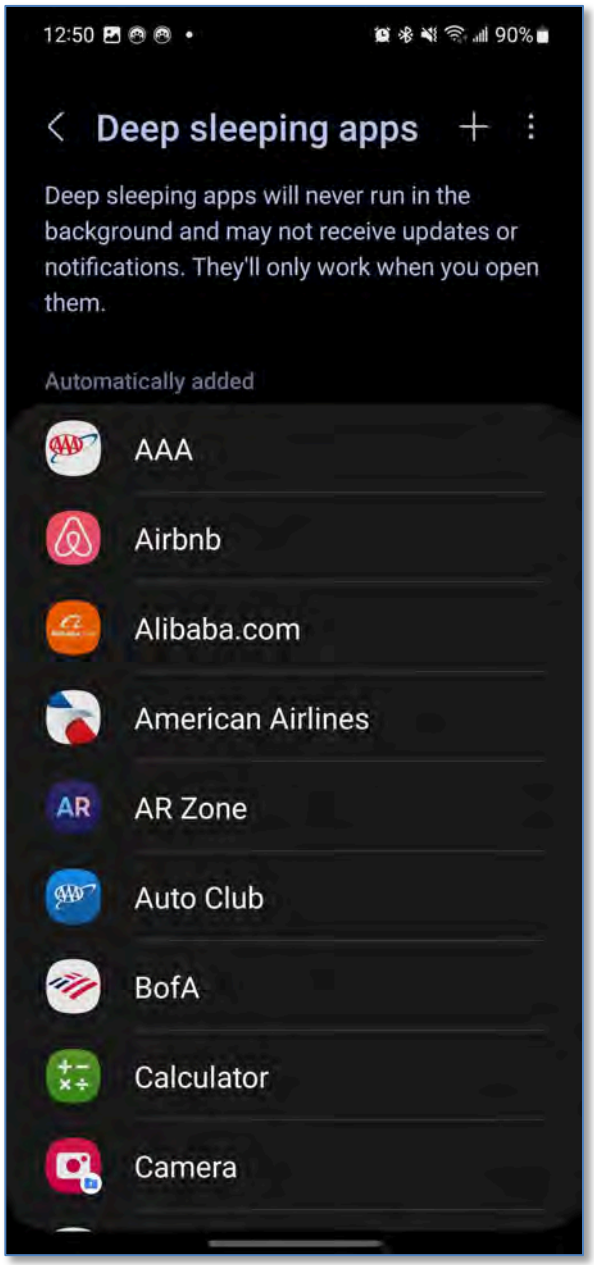
Claim	Public Documentation
	; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler; https://developer.android.com/guide/background/persistent; https://developer.android.com/guide/components/services; https://developer.android.com/guide/components/activities/intro-activities; https://developer.android.com/reference/java/net/URLConnection; https://developer.android.com/training/articles/security-ssl; https://developer.android.com/reference/android/net/DnsResolver; https://developer.android.com/guide/topics/media; https://developer.android.com/media; https://developer.android.com/guide/topics/media/platform/mediaplayer; https://developer.apple.com/documentation/networkextension/dns_settings; *see also* the exemplary screenshots below:

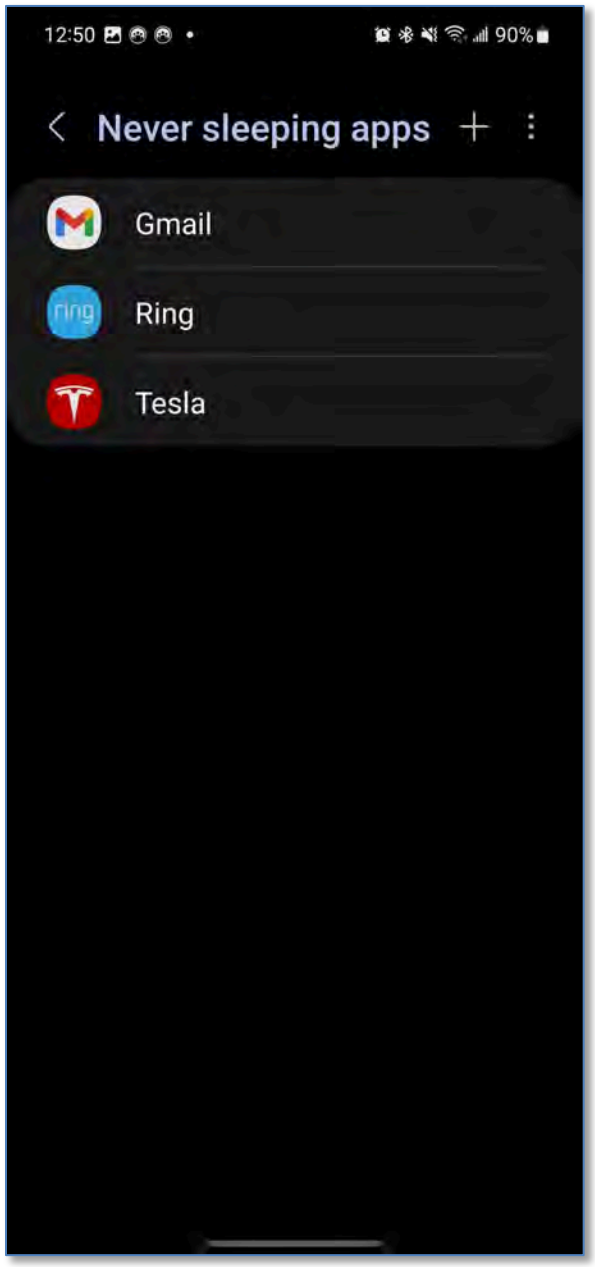

12:50
91%
Battery
9 h 27 m left
91% available
Power saving
Background usage limits
Usage since last full charge
100
0%
10 h 16 m ago
9 h 27 m left
Battery use
Estimated time
A full charge will last about:
10 h 23 m
View details


12:50
90%
Background usage limits
Limit battery usage for apps that you don't use often.
Put unused apps to sleep
Sleeping apps 4
Deep sleeping apps 85
Never sleeping apps 3

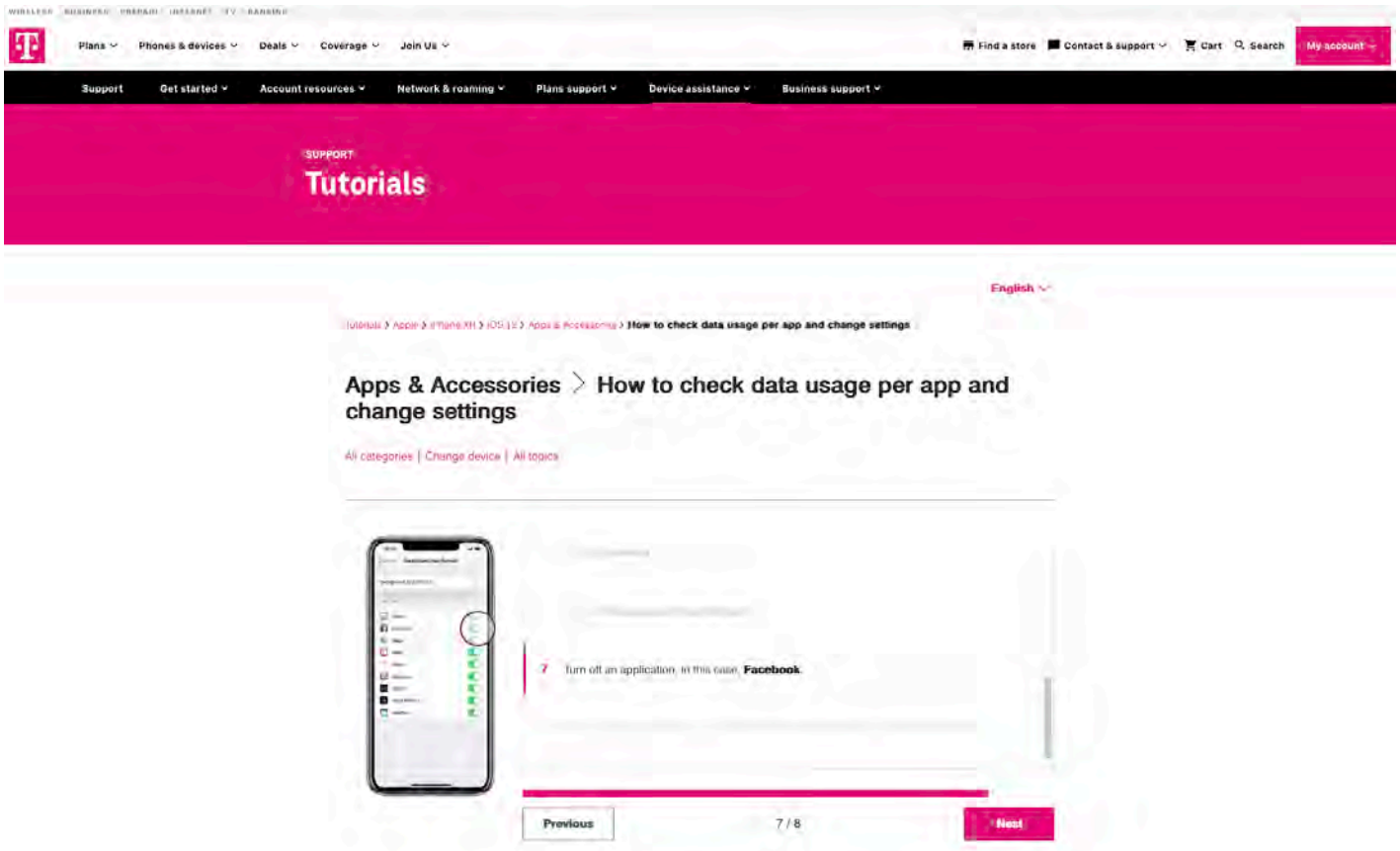

12:50
90%
More battery settings
Adaptive battery
Extend battery life based on your phone usage.
Processing speed
Optimized
Show battery percentage
Show charging information
Show battery level and estimated time until full when Always On Display is off or not shown.
Fast charging
Super fast charging
Fast wireless charging
Protect battery
To extend the lifespan of your battery, limit the maximum charge to 85%.

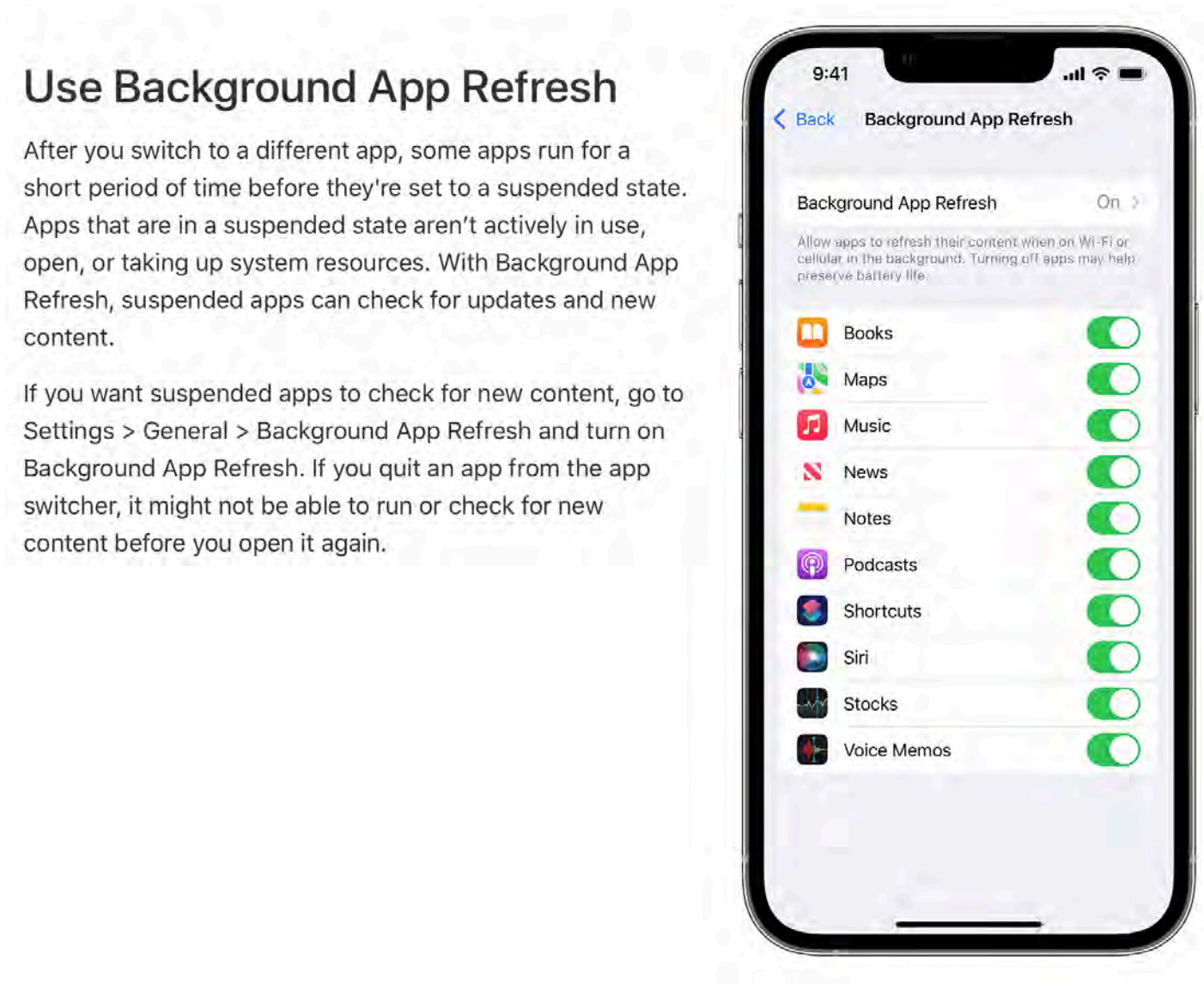

12:50
90%
Sleeping apps
Sleeping apps will run in the background only occasionally. Updates and notifications may be delayed.
User-added
Home
Teams
YouTube
Automatically added
Google Wifi


12:50
90%
Deep sleeping apps
Deep sleeping apps will never run in the background and may not receive updates or notifications. They'll only work when you open them.
Automatically added
AAA
Airbnb
Alibaba.com
American Airlines
AR Zone
Auto Club
BofA
Calculator
Camera


12:50
90%
Never sleeping apps
Gmail
Ring
Tesla

Claim	Public Documentation
	; *see also* https://techshift.net/does-data-saver-apply-to-wi-fi/: "**Does data saver apply to Wi-Fi?** Does data saver affect WiFi? **No, it doesn't**. Data saver only restricts the apps from using mobile data. While you are on WiFi, your phone's data saver won't affect it." ; https://www.technipages.com/how-to-give-android-apps-unrestricted-data-access-data-saver-on: "The Data Saver option is only when you're not on WiFi and affects how you see your content." As another example, at least Apple's "Background App Refresh" and "Low Power Mode" features include policies which distinguish between applications and/or services. *See e.g.*, https://www.t-mobile.com/support/tutorials/device/apple/iphone-xr/topic/apps-amp-accessories/how-to-check-data-usage-per-app-and-change-settings/7

Claim	Public Documentation
	 ; https://support.apple.com/en-us/HT202070:

Claim	Public Documentation
	 https://support.apple.com/en-us/HT205234:

Use Low Power Mode to save battery life on your iPhone or iPad

Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

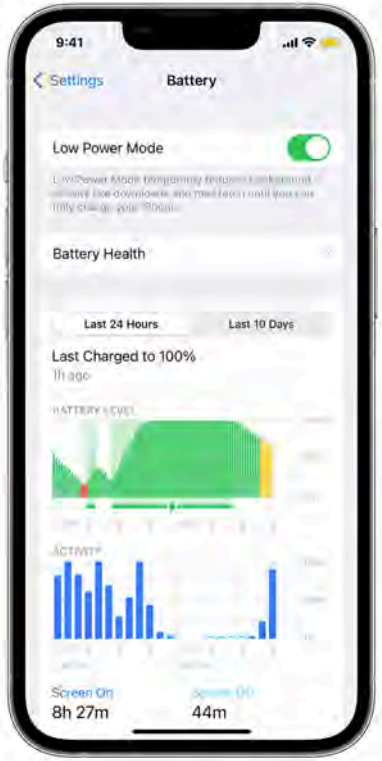
To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.

Low Power Mode reduces or affects these features:

- 5G (except for video streaming) on iPhone 12 and iPhone 13 models[1]
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display[2]
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.



1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

Claim	Public Documentation
	https://www.apple.com/batteries/maximizing-performance/:

View Battery Usage information

With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery.

Here are the messages you may see listed below the apps you've been using:

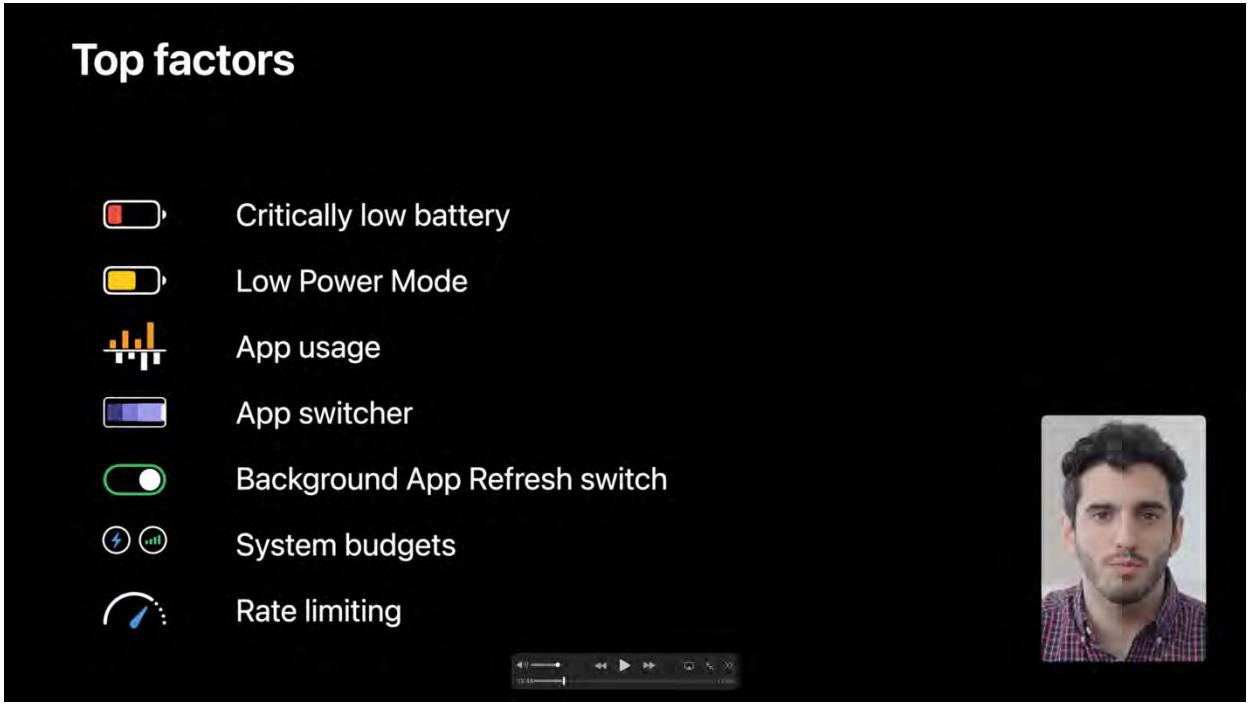
Background Activity. This indicates that the battery was used by the app while it was in the background — that is, while you were using another app.

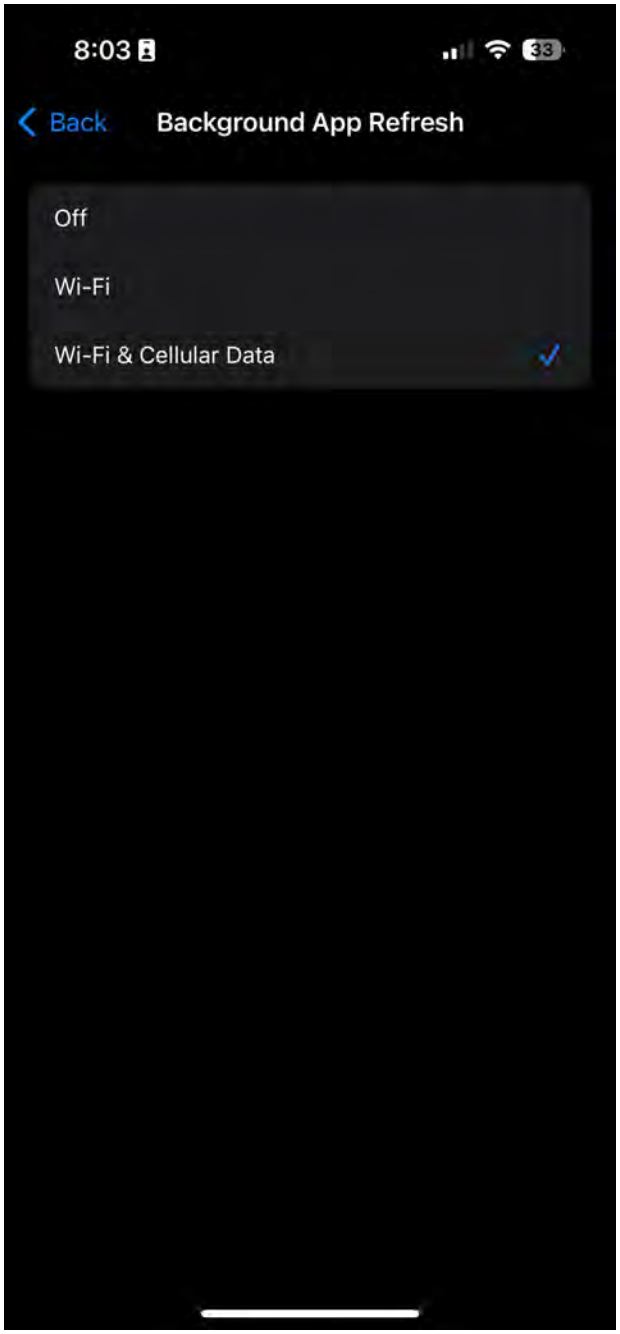
- To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely.
- If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data.

; https://support.apple.com/en-us/HT213336; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/; https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/prepar-

Claim	Public Documentation
	ing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks https://developer.apple.com/documentation/backgroundtasks/bgapprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocessingtask; https://developer.apple.com/documentation/backgroundtasks/bgtask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate; https://developer.apple.com/documentation/uikit/uiapplication/state; https://developer.apple.com/documentation/watchkit/background_execution; https://developer.apple.com/documentation/foundation/url_loading_system; https://developer.apple.com/documentation/foundation/urlsession; https://developer.apple.com/documentation/devicemanagement/mail; https://developer.apple.com/documentation/security/secure_transport/using_the_secure_socket_layer_for_network_communication; https://developer.apple.com/documentation/networkextension/personal_vpn; https://developer.apple.com/documentation/foundation/nsproxy; https://developer.apple.com/documentation/messages; https://developer.apple.com/documentation/avfoundation/avplayer; https://developer.apple.com/documentation/avfoundation/media_playback/configuring_your_app_for_media_playback; https://developer.apple.com/videos/play/wwdc2019/707/; https://developer.apple.com/videos/play/wwdc2020/10063:

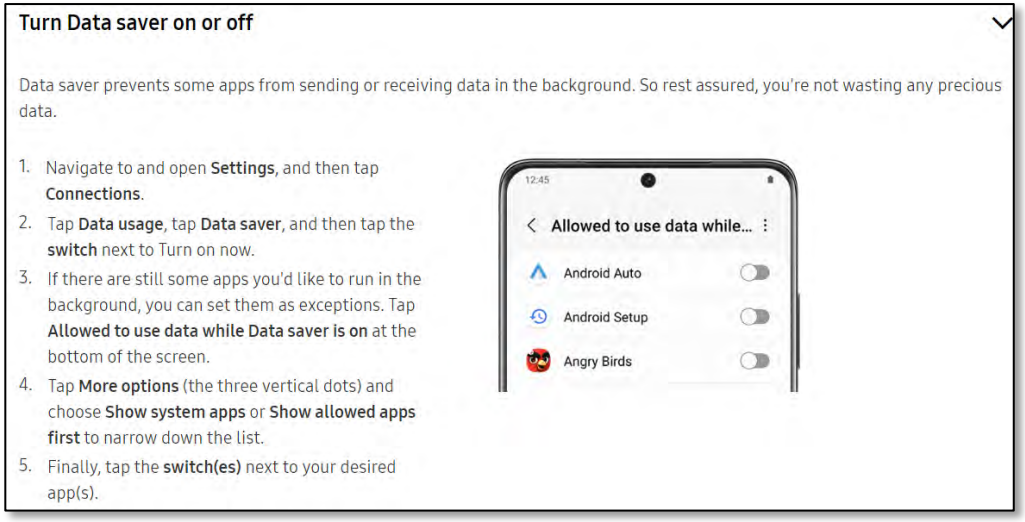
Claim	Public Documentation

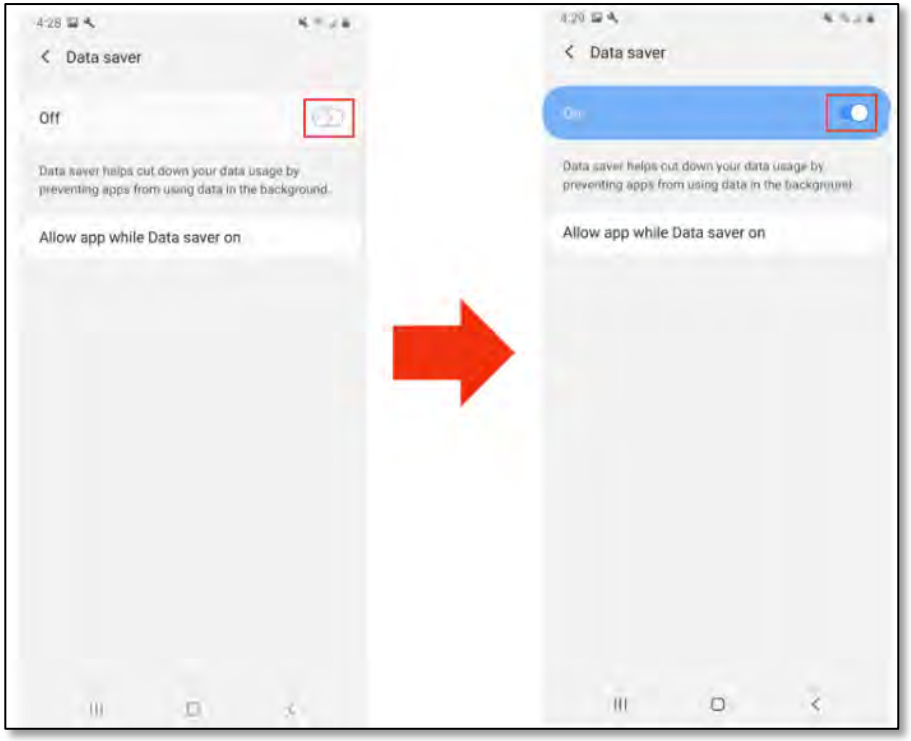
Claim	Public Documentation
	 ; *see also* exemplary screen shots below:

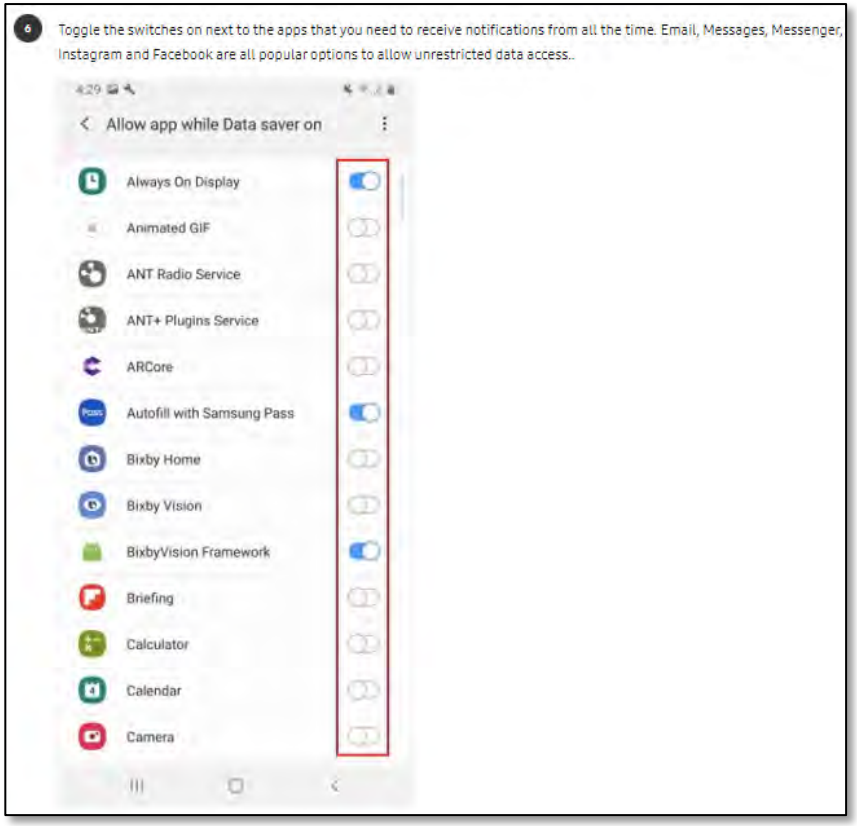

8:03
33
Back
Background App Refresh
Off
Wi-Fi
Wi-Fi & Cellular Data

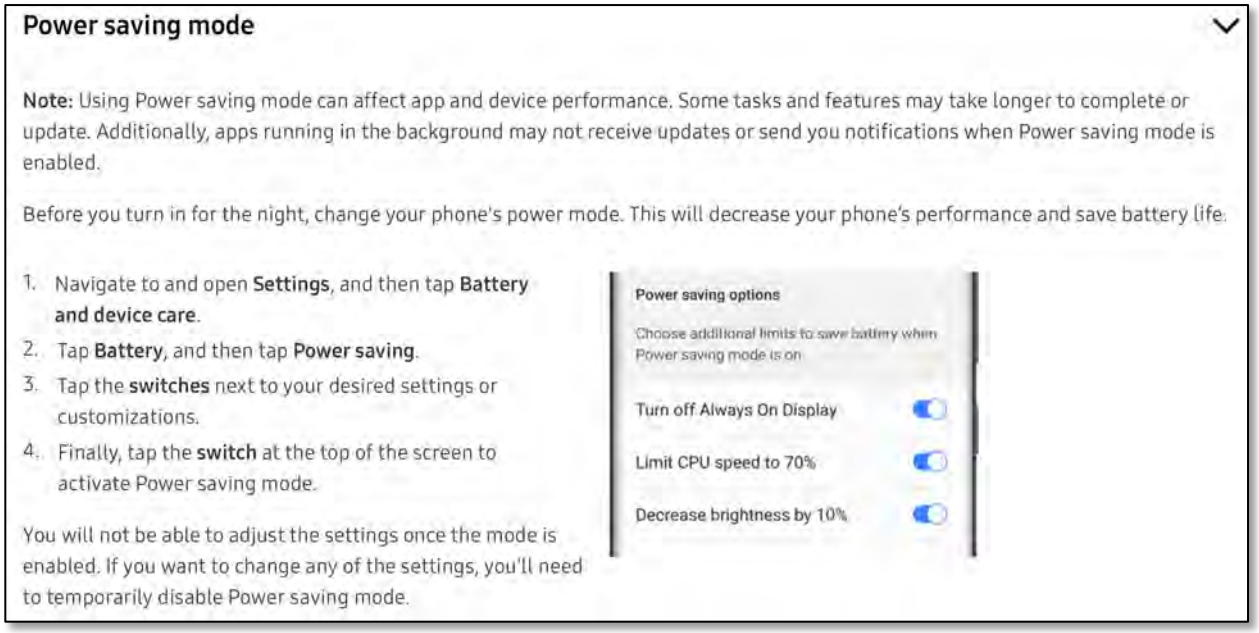
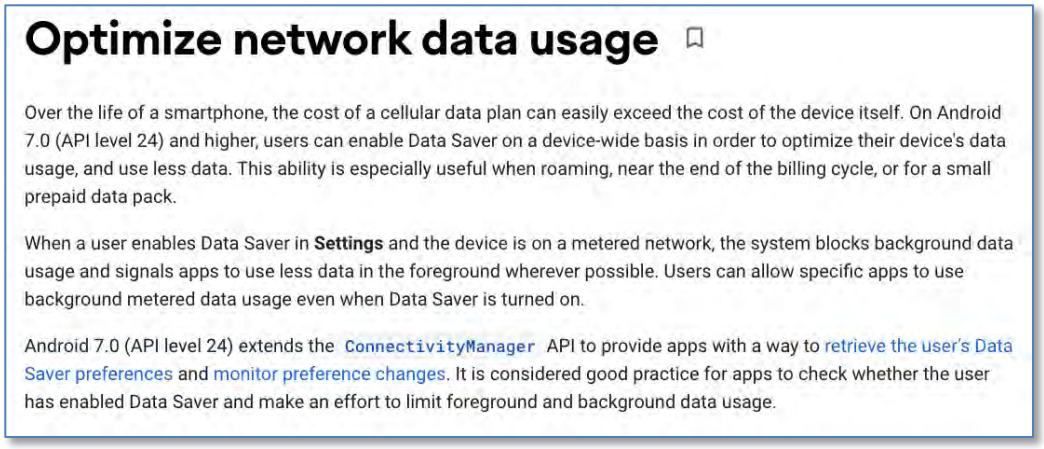
Claim	Public Documentation
	 See also, e.g., https://www.t-mobile.com/cell-phone-plans; https://www.t-mobile.com/cell-phone-plans/affordable-data-plans; https://www.t-mobile.com/business?INTNAV=tNav%3ABusiness; https://prepaid.t-mobile.com; https://www.t-mobile.com/cell-phone-plans/international-roaming-plans; https://www.t-mobile.com/support/coverage/domestic-roaming-data; https://www.t-mobile.com/customers/unlimited-roaming-sms-data; https://www.t-mobile.com/apps/t-mobile-app; https://www.t-mobile.com/apps/t-mobile-family-mode; https://www.t-mobile.com/support/devices/not-sold-by-t-mobile/byod-t-mobile-data-and-apn-settings; https://www.t-mobile.com/support/tutorials/device/apple/iphone-x/topic/connections-amp-network/apn-and-data-settings.
[1e] a differential traffic control policy applicable to at least some Internet service activities by or on behalf of the first one or more applications;	The Accused Instrumentalities comprises "a differential traffic control policy applicable to at least some Internet service activities by or on behalf of the first one or more applications." For example, Samsung's "Data Saver," or "Power Saver," "Doze Mode," "App Standby," "Adaptive Battery," and/or "JobScheduler" features include policies which apply to at least some activities by or on behalf of ap-

Claim	Public Documentation
	plications and/or services. *See, e.g.*, https://www.t-mobile.com/support/public-files/attachments/samsung/samsung-galaxy-s21-fe-5g/Samsung%20Galaxy%20S21%20FE%205G_English%20User%20Guide_FINAL2.pdf: **Data usage** Check your current mobile and Wi-Fi data usage. You can also customize warnings and limits. ○ From Settings, tap Connections > Data usage. **Turn on Data saver** Use Data saver to reduce your data consumption by preventing selected apps from sending or receiving data in the background. 1. From Settings, tap Connections > Data usage > Data saver. 2. Tap to turn on Data saver. • To allow some apps to have unrestricted data usage, tap **Allowed to use data while Data saver is on**, and tap next to each app to specify restrictions. ; https://www.samsung.com/us/support/answer/ANS00079018/:

Claim	Public Documentation
	 ; https://www.samsung.com/ae/support/mobile-devices/android-pie-what-is-the-data-saver-feature/:

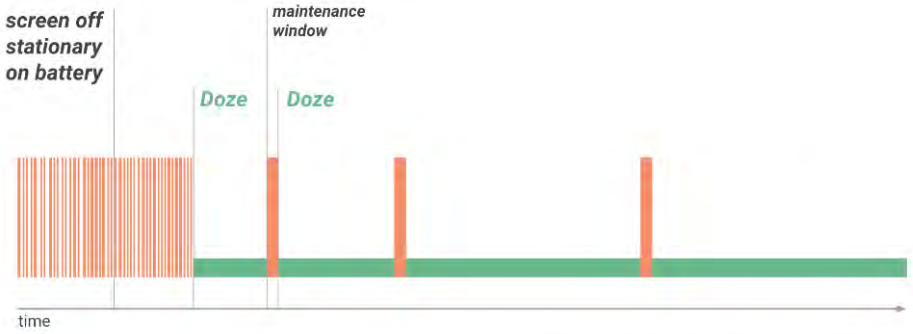
Claim	Public Documentation
	

Claim	Public Documentation
	 ; https://www.samsung.com/us/support/answer/ANS00078987/:

Claim	Public Documentation
	 ; https://developer.android.com/training/basics/network-ops/data-saver: 

Claim	Public Documentation

	Check data saver preferences
	On Android 7.0 (API level 24) and higher, apps can use the `ConnectivityManager` API to determine what data usage restrictions are being applied. The `getRestrictBackgroundStatus()` method returns one of the following values:
	`RESTRICT_BACKGROUND_STATUS_DISABLED`
	Data Saver is disabled.
	`RESTRICT_BACKGROUND_STATUS_ENABLED`
	The user has enabled Data Saver for this app. Apps should make an effort to limit data usage in the foreground and gracefully handle restrictions to background data usage.
	`RESTRICT_BACKGROUND_STATUS_WHITELISTED`
	The user has enabled Data Saver but the app is allowed to bypass it. Apps should still make an effort to limit foreground and background data usage.
	Limit data usage whenever the device is connected to a metered network, even if Data Saver is disabled or the app is allowed to bypass it. The following sample code uses `ConnectivityManager.isActiveNetworkMetered()` and `ConnectivityManager.getRestrictBackgroundStatus()` to determine how much data the app should use:
	; https://developer.android.com/training/monitoring-device-state/doze-standby:
	Optimize for Doze and App Standby
	Starting from Android 6.0 (API level 23), Android introduces two power-saving features that extend battery life for users by managing how apps behave when a device is not connected to a power source. *Doze* reduces battery consumption by deferring background CPU and network activity for apps when the device is unused for long periods of time. *App Standby* defers background network activity for apps with which the user has not recently interacted.
	While the device is in Doze, apps' access to certain battery-intensive resources is deferred until maintenance windows. The specific restrictions are listed in Power Management Restrictions.
	Doze and App Standby manage the behavior of all apps running on Android 6.0 or higher, regardless whether they are specifically targeting API level 23. To ensure the best experience for users, test your app in Doze and App Standby modes and make any necessary adjustments to your code. The sections below provide details.

Claim	Public Documentation
	Understanding Doze If a user leaves a device unplugged and stationary for a period of time, with the screen off, the device enters Doze mode. In Doze mode, the system attempts to conserve battery by restricting apps' access to network and CPU-intensive services. It also prevents apps from accessing the network and defers their jobs, syncs, and standard alarms. Periodically, the system exits Doze for a brief time to let apps complete their deferred activities. During this *maintenance window*, the system runs all pending syncs, jobs, and alarms, and lets apps access the network.  **Figure 1.** Doze provides a recurring maintenance window for apps to use the network and handle pending activities. At the conclusion of each maintenance window, the system again enters Doze, suspending network access and deferring jobs, syncs, and alarms. Over time, the system schedules maintenance windows less and less frequently, helping to reduce battery consumption in cases of longer-term inactivity when the device is not connected to a charger. As soon as the user wakes the device by moving it, turning on the screen, or connecting a charger, the system exits Doze and all apps return to normal activity. The Doze restriction on network access is also likely to affect your app, especially if the app relies on real-time messages such as tickles or notifications. If your app requires a persistent connection to the network to receive messages, you should use Firebase Cloud Messaging (FCM) if possible. ; https://developer.android.com/topic/performance/appstandby:

App Standby Buckets

Android 9 (API level 28) and higher support **App Standby Buckets**. App Standby Buckets help the system prioritize apps' requests for resources based on how recently and how frequently the apps are used. Based on app usage patterns, each app is placed in one of five priority **buckets**. The system limits the device resources available to each app based on which bucket the app is in.

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The system dynamically assigns each app to a priority bucket, reassigning the apps as needed. The system may rely on a preloaded app that uses machine learning to determine how likely each app is to be used, and assigns apps to the appropriate buckets. If the system app is not present on a device, the system defaults to sorting apps based on how recently they were used. More active apps are assigned to buckets that give the apps higher priority, making more system resources available to the app. In particular, the bucket determines how frequently the app's jobs run, and how often the app can trigger alarms. These restrictions apply only while the device is on battery power; the system does not impose these restrictions on apps while the device is charging.

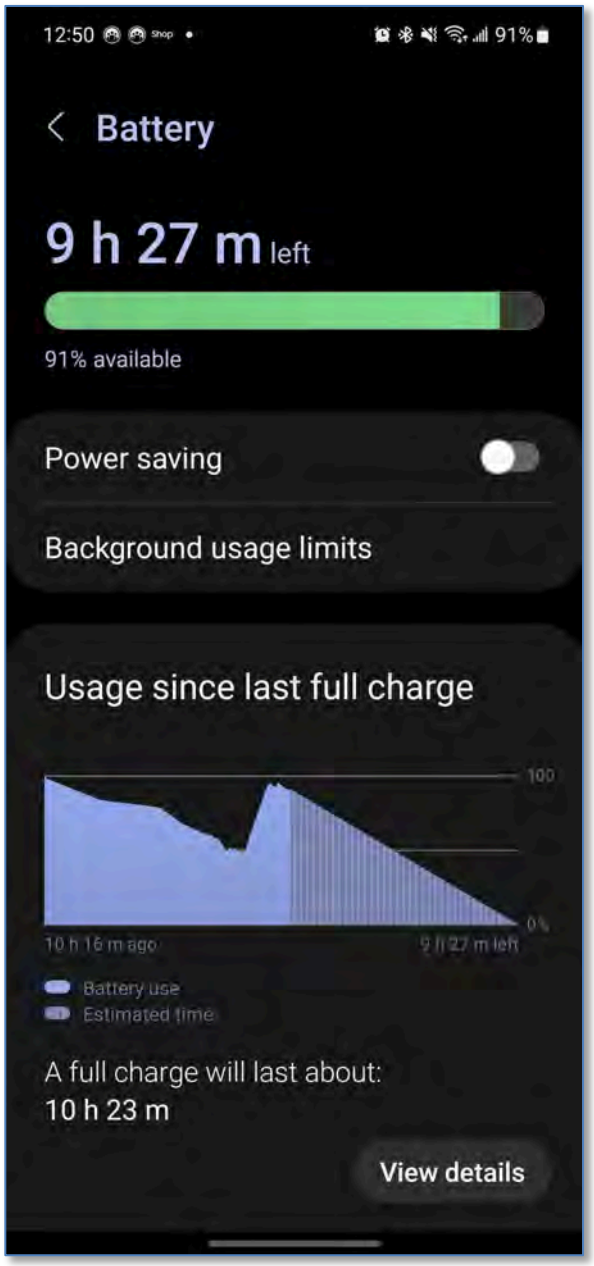
Note: Every manufacturer can set their own criteria for how non-active apps are assigned to buckets. You should not try to influence which bucket your app is assigned to. Instead, focus on making sure your app behaves well in whatever bucket it might be in. Your app can find out what bucket it's currently in by calling `UsageStatsManager.getAppStandbyBucket()`.

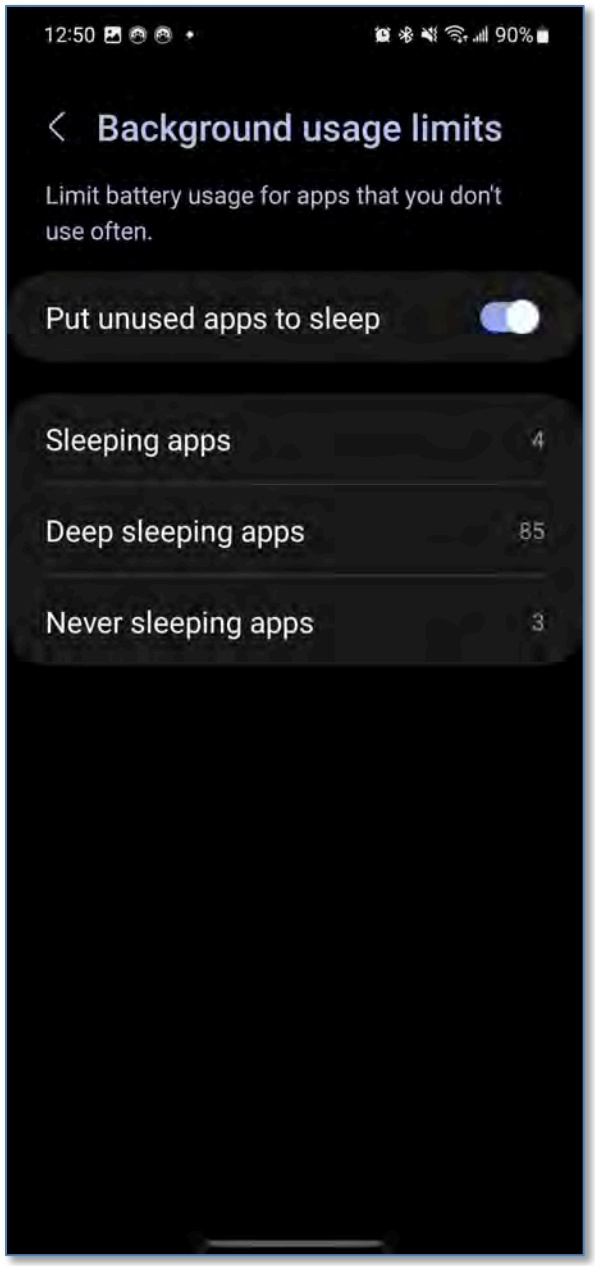
The buckets are:

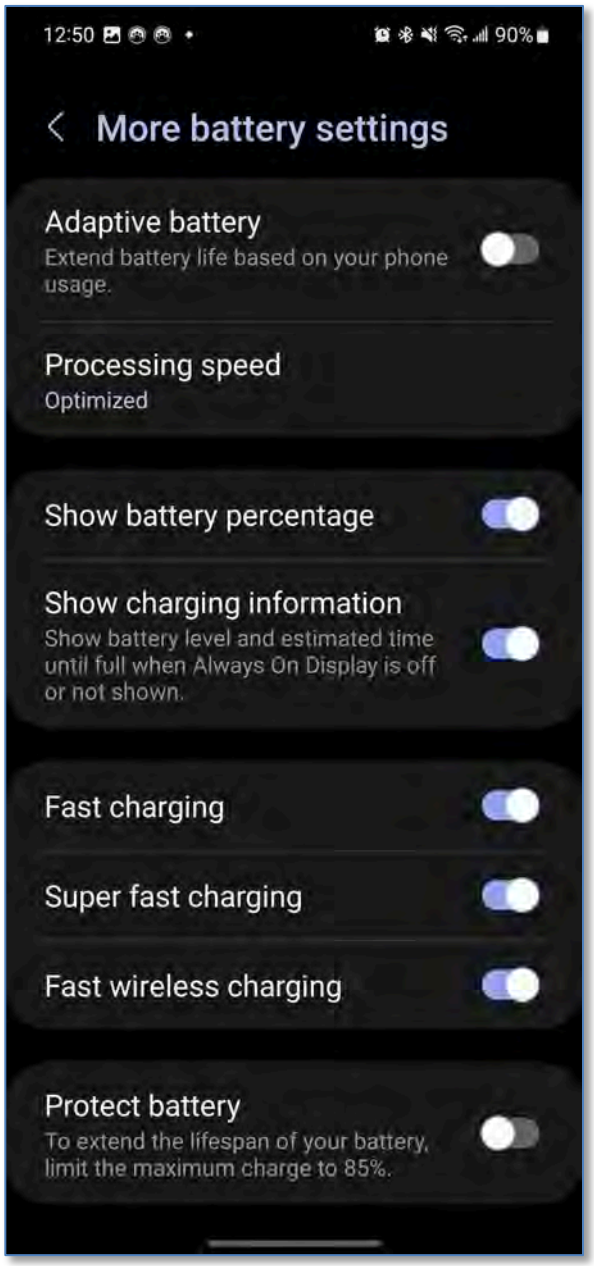
1. Active: App is currently being used or was very recently used.
2. Working set: App is in regular use.
3. Frequent: App is often used, but not every day.
4. Rare: App is not frequently used.
5. Restricted: App consumes a great deal of system resources, or may exhibit undesirable behavior.

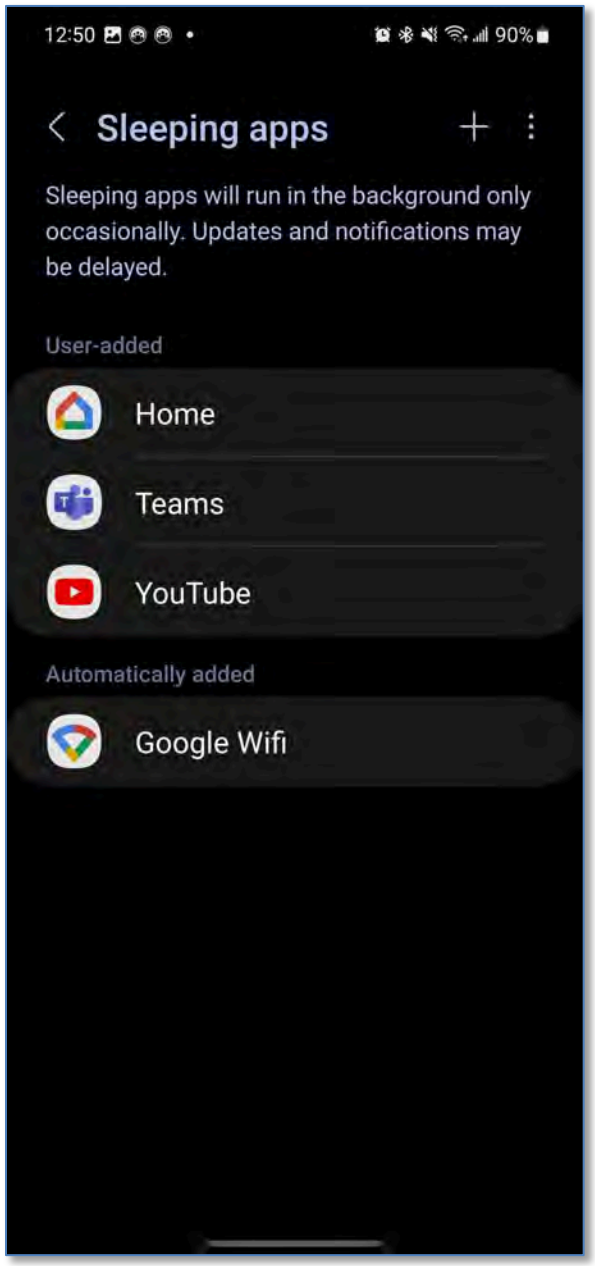
In addition, there's a special **never** bucket for apps that have been installed but have never been run. The system imposes severe restrictions on these apps.

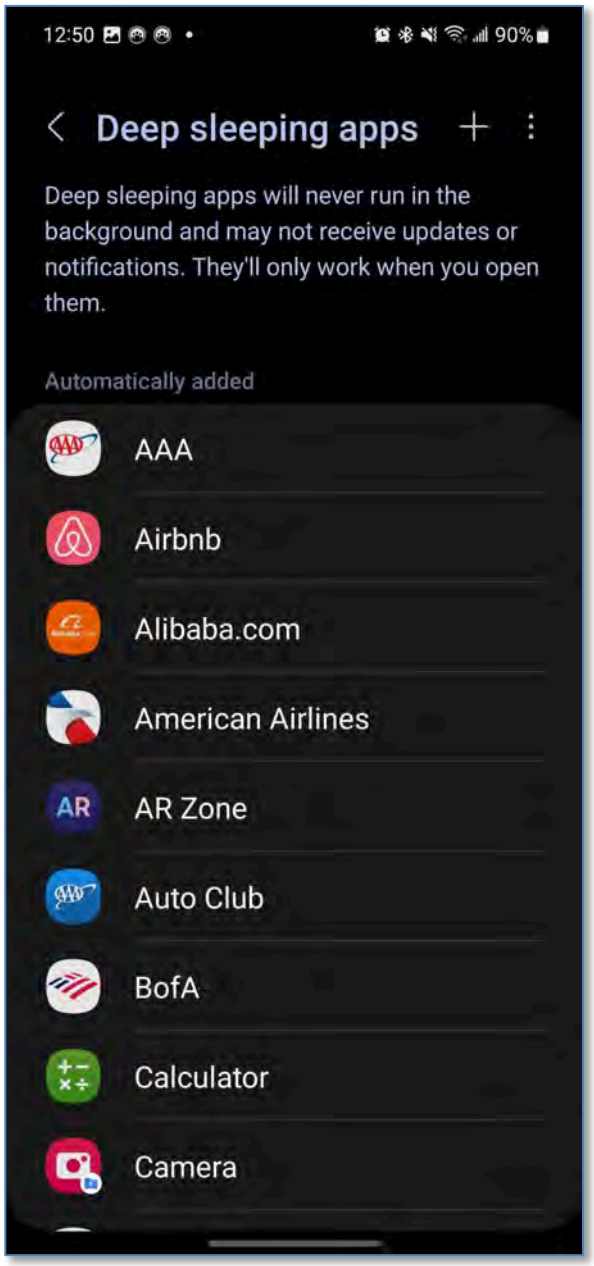
Claim	Public Documentation
	; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler; https://developer.android.com/guide/background/persistent; https://developer.android.com/guide/components/services; https://developer.android.com/guide/components/activities/intro-activities; https://developer.android.com/reference/java/net/URLConnection; https://developer.android.com/training/articles/security-ssl; https://developer.android.com/reference/android/net/DnsResolver; https://developer.android.com/guide/topics/media; https://developer.android.com/media; https://developer.android.com/guide/topics/media/platform/mediaplayer; https://developer.apple.com/documentation/networkextension/dns_settings; *see also* the exemplary screenshots below:

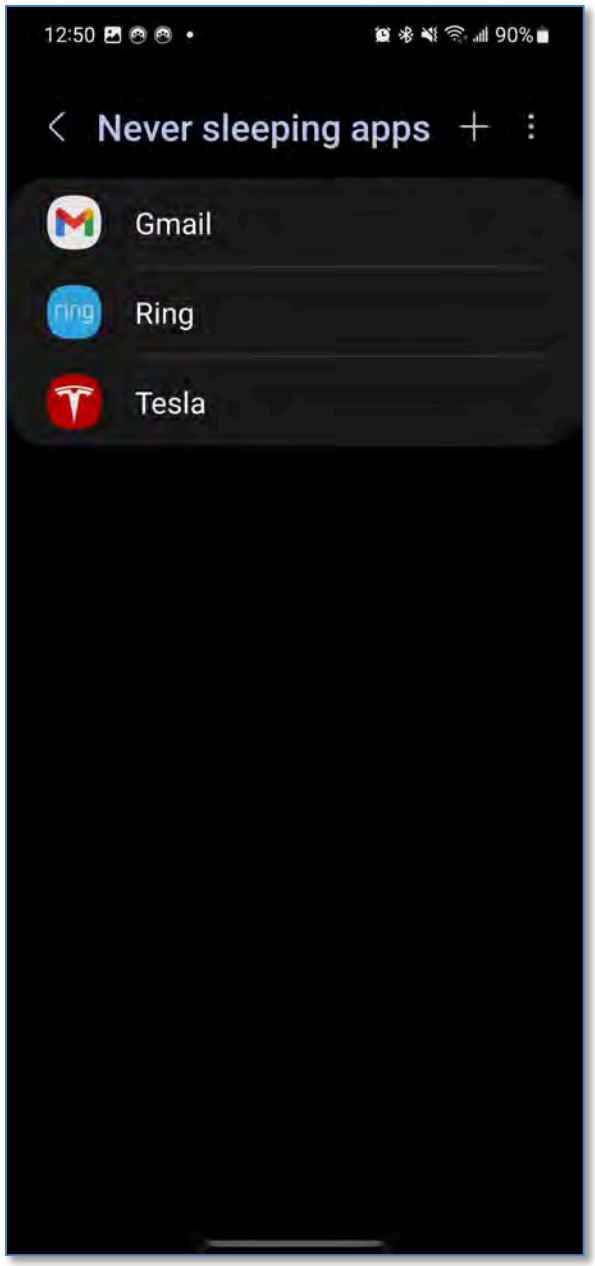

12:50
91%
Battery
9 h 27 m left
91% available
Power saving
Background usage limits
Usage since last full charge
100
0%
10 h 16 m ago
9 h 27 m left
Battery use
Estimated time
A full charge will last about:
10 h 23 m
View details


12:50
90%
Background usage limits
Limit battery usage for apps that you don't use often.
Put unused apps to sleep
Sleeping apps 4
Deep sleeping apps 85
Never sleeping apps 3

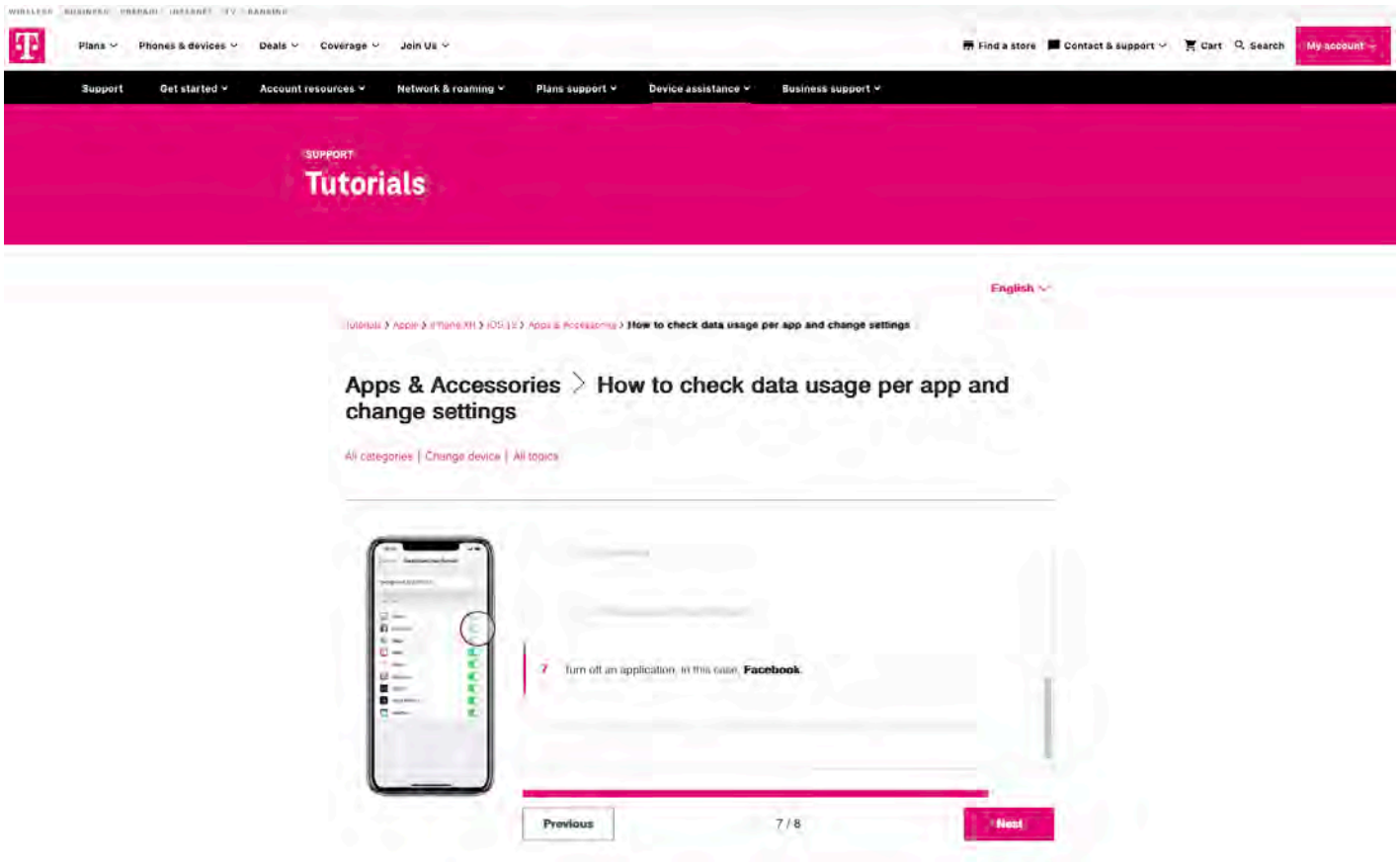

12:50
90%
More battery settings
Adaptive battery
Extend battery life based on your phone usage.
Processing speed
Optimized
Show battery percentage
Show charging information
Show battery level and estimated time until full when Always On Display is off or not shown.
Fast charging
Super fast charging
Fast wireless charging
Protect battery
To extend the lifespan of your battery, limit the maximum charge to 85%.

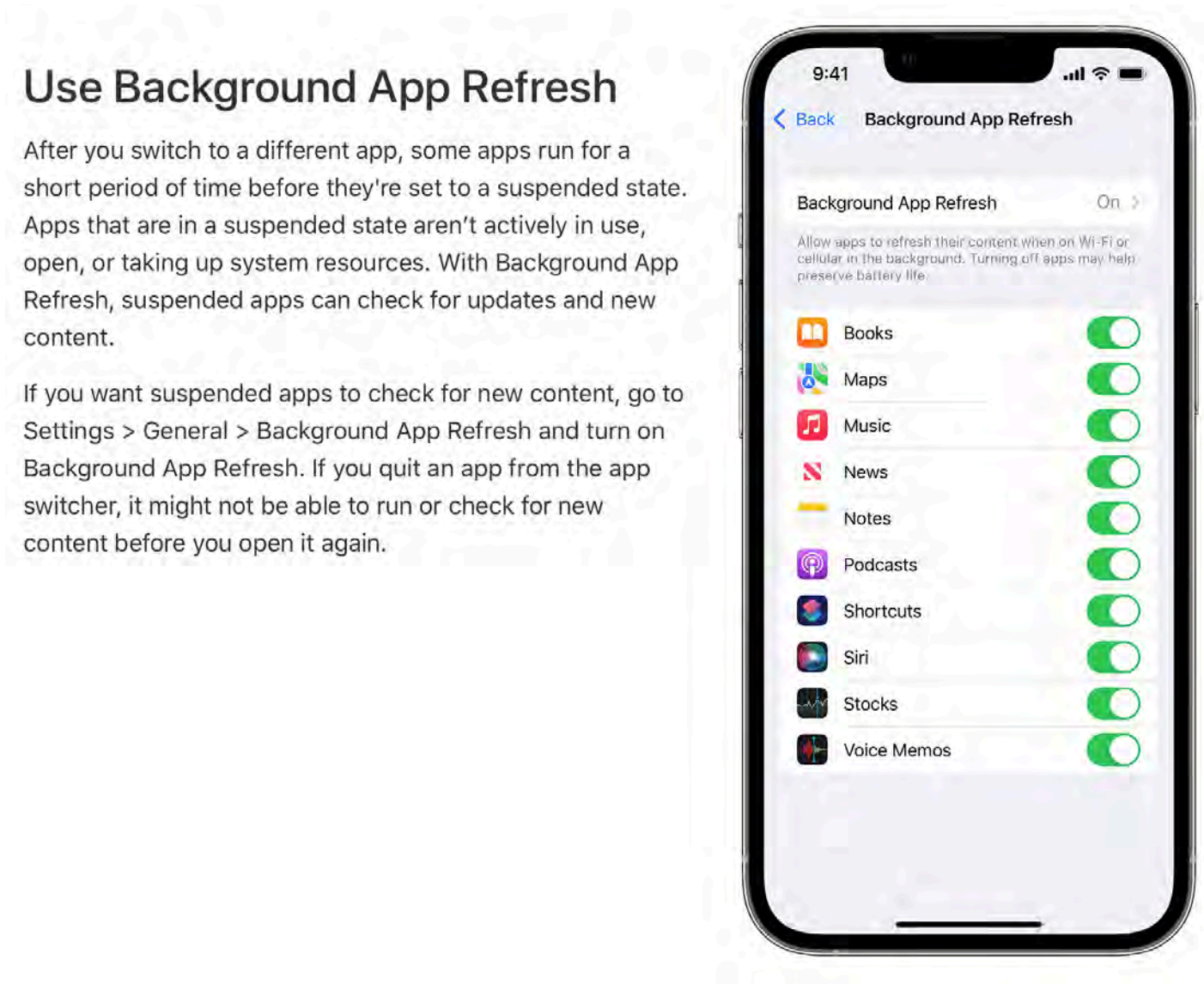

12:50
90%
Sleeping apps
Sleeping apps will run in the background only occasionally. Updates and notifications may be delayed.
User-added
Home
Teams
YouTube
Automatically added
Google Wifi


12:50
90%
Deep sleeping apps
Deep sleeping apps will never run in the background and may not receive updates or notifications. They'll only work when you open them.
Automatically added
AAA
Airbnb
Alibaba.com
American Airlines
AR Zone
Auto Club
BofA
Calculator
Camera


12:50
90%
Never sleeping apps
Gmail
Ring
Tesla

Claim	Public Documentation
	; *see also* https://techshift.net/does-data-saver-apply-to-wi-fi/: "**Does data saver apply to Wi-Fi?** Does data saver affect WiFi? **No, it doesn't**. Data saver only restricts the apps from using mobile data. While you are on WiFi, your phone's data saver won't affect it." ; https://www.technipages.com/how-to-give-android-apps-unrestricted-data-access-data-saver-on: "The Data Saver option is only when you're not on WiFi and affects how you see your content." As another example, at least Apple's "Background App Refresh" and "Low Power Mode" features include policies which apply to at least some activities by or on behalf of applications and/or services. *See e.g.*, https://www.t-mobile.com/support/tutorials/device/apple/iphone-xr/topic/apps-amp-accessories/how-to-check-data-usage-per-app-and-change-settings/7

Claim	Public Documentation
	 ; https://support.apple.com/en-us/HT202070:

Claim	Public Documentation
	 https://support.apple.com/en-us/HT205234:

Use Low Power Mode to save battery life on your iPhone or iPad

Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

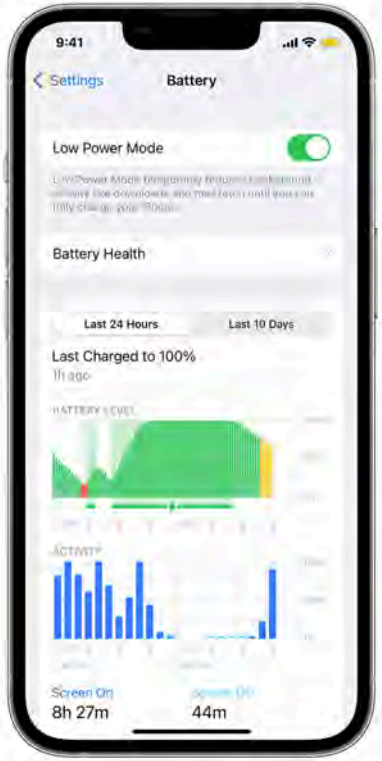
To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.

Low Power Mode reduces or affects these features:

- 5G (except for video streaming) on iPhone 12 and iPhone 13 models[1]
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display[2]
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.



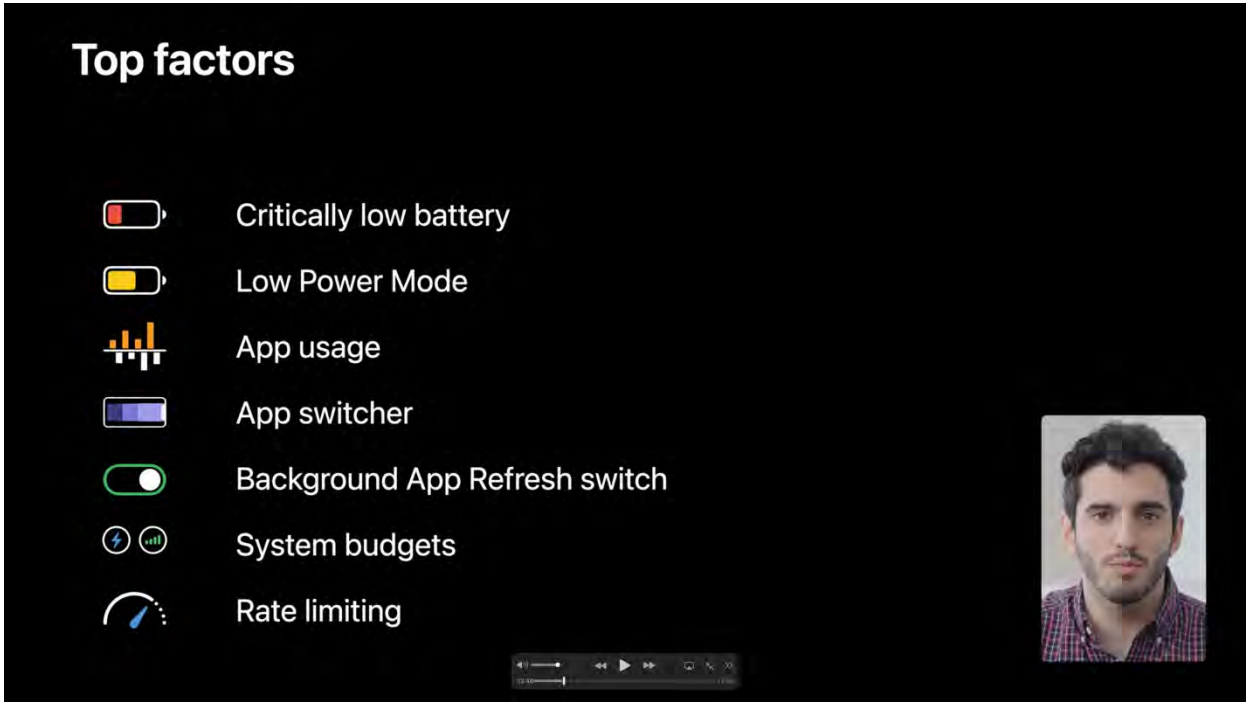
1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

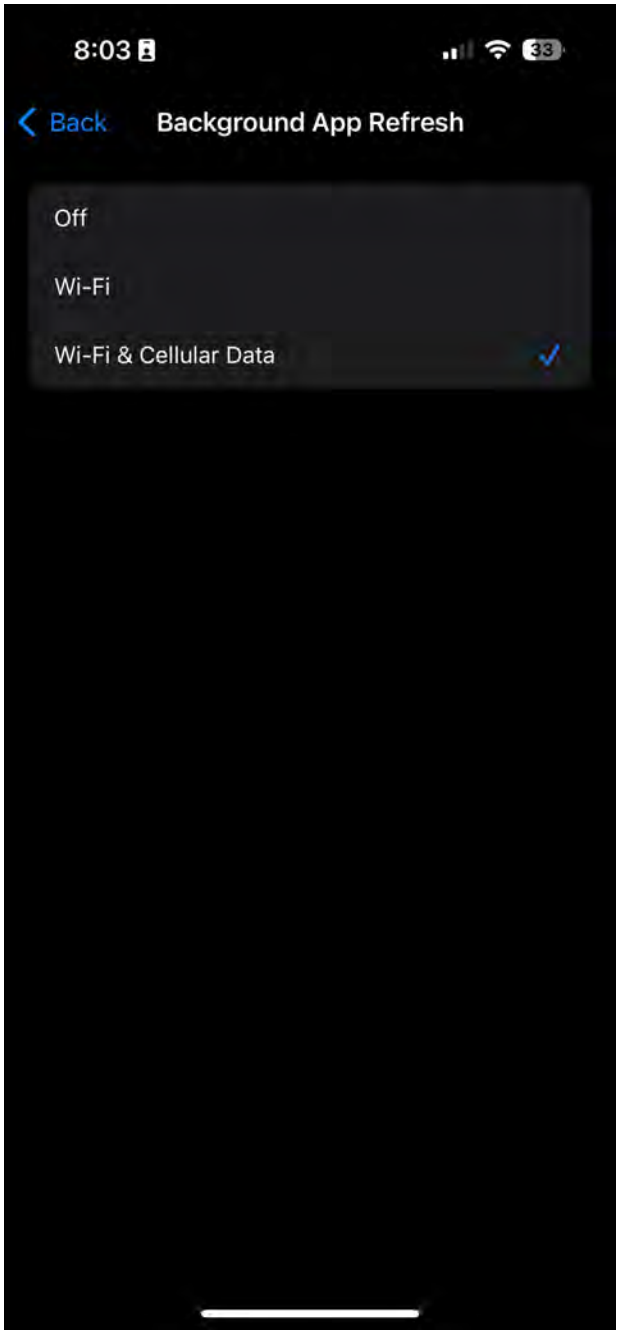
2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

Claim	Public Documentation
	https://www.apple.com/batteries/maximizing-performance/: **View Battery Usage information** With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery. Here are the messages you may see listed below the apps you've been using: **Background Activity.** This indicates that the battery was used by the app while it was in the background — that is, while you were using another app. • To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely. • If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data. ; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/; https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/prepar-

Claim	Public Documentation
	ing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks https://developer.apple.com/documentation/backgroundtasks/bgapprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocessingtask; https://developer.apple.com/documentation/backgroundtasks/bgtask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate; https://developer.apple.com/documentation/uikit/uiapplication/state; https://developer.apple.com/documentation/foundation/url_loading_system; https://developer.apple.com/documentation/foundation/urlsession; https://developer.apple.com/documentation/devicemanagement/mail; https://developer.apple.com/documentation/security/secure_transport/using_the_secure_socket_layer_for_network_communication; https://developer.apple.com/documentation/networkextension/personal_vpn; https://developer.apple.com/documentation/foundation/nsproxy; https://developer.apple.com/documentation/messages; https://developer.apple.com/documentation/avfoundation/avplayer; https://developer.apple.com/documentation/avfoundation/media_playback/configuring_your_app_for_media_playback; https://developer.apple.com/videos/play/wwdc2019/707/; https://developer.apple.com/videos/play/wwdc2020/10063:

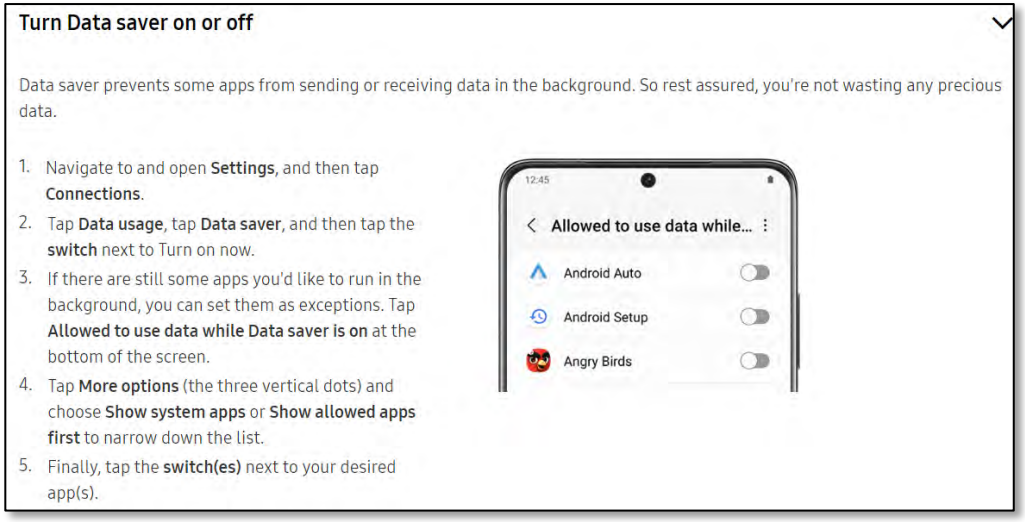
Claim	Public Documentation

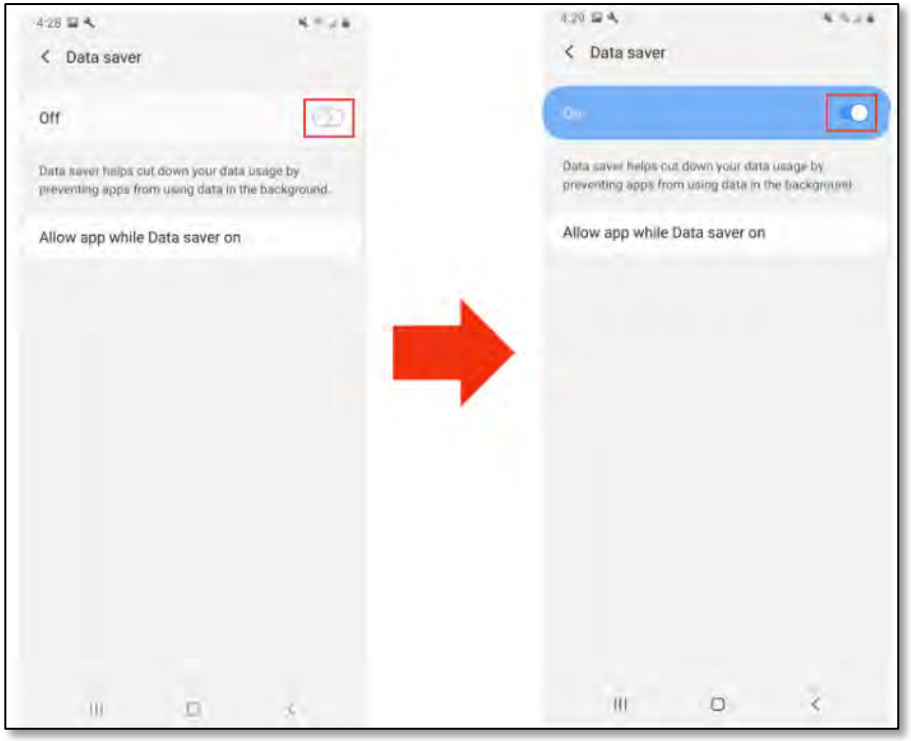
Claim	Public Documentation
	 ; *see also* exemplary screen shots below:

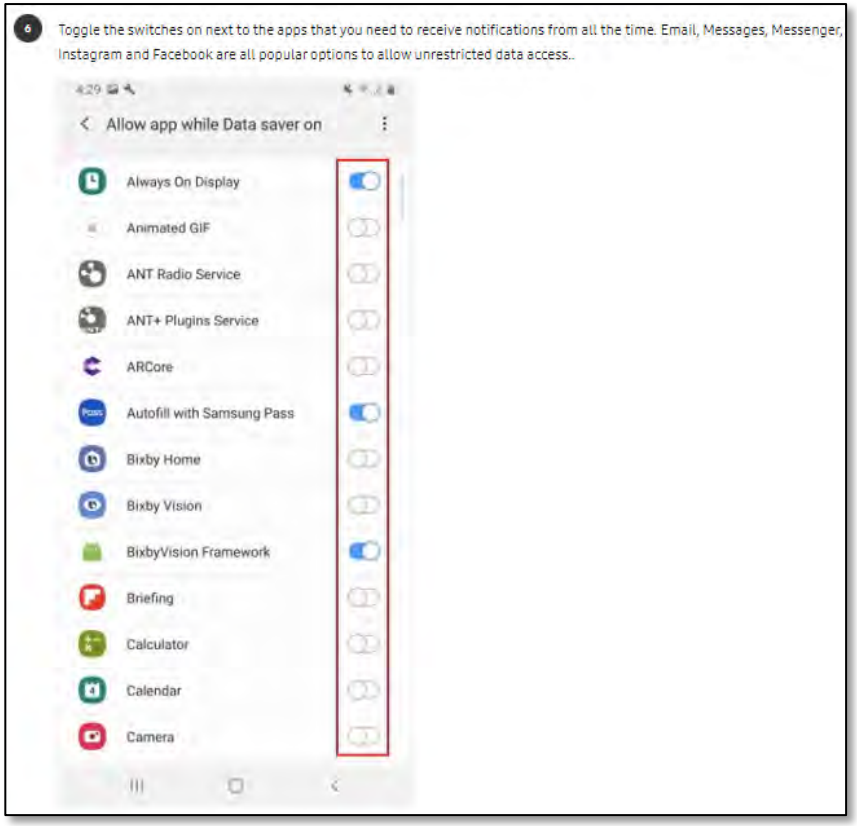

8:03
33
Back
Background App Refresh
Off
Wi-Fi
Wi-Fi & Cellular Data

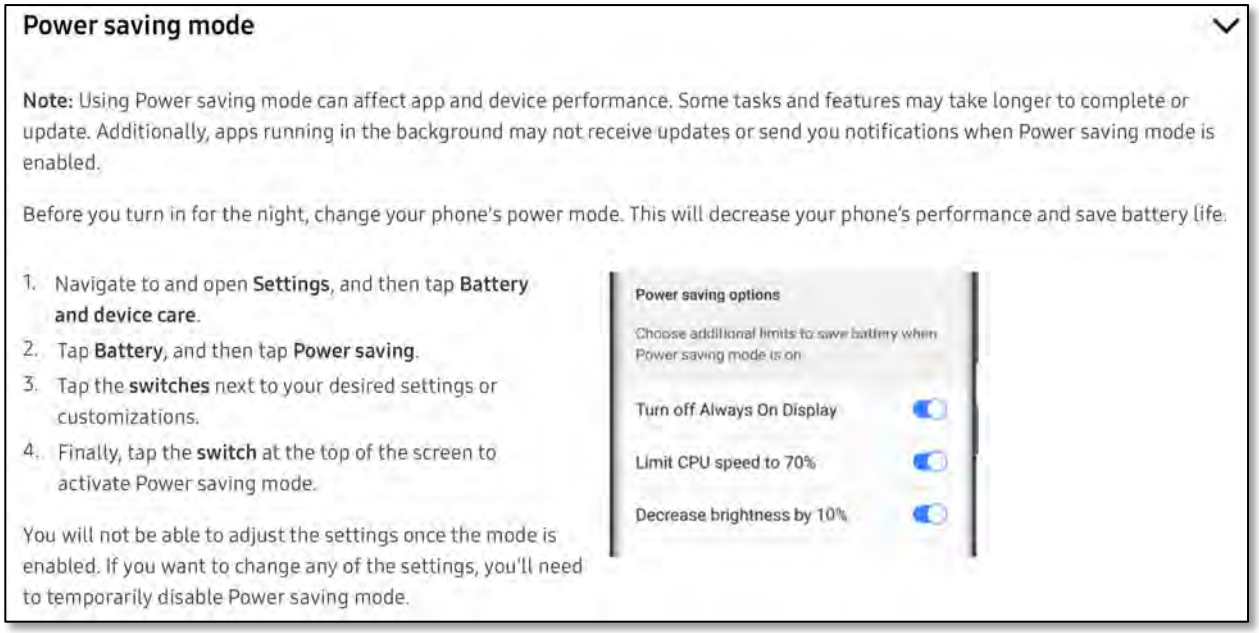
Claim	Public Documentation
	 See also, e.g., https://www.t-mobile.com/cell-phone-plans; https://www.t-mobile.com/cell-phone-plans/affordable-data-plans; https://www.t-mobile.com/business?INTNAV=tNav%3ABusiness; https://prepaid.t-mobile.com; https://www.t-mobile.com/cell-phone-plans/international-roaming-plans; https://www.t-mobile.com/support/coverage/domestic-roaming-data; https://www.t-mobile.com/customers/unlimited-roaming-sms-data; https://www.t-mobile.com/apps/t-mobile-app; https://www.t-mobile.com/apps/t-mobile-family-mode; https://www.t-mobile.com/support/devices/not-sold-by-t-mobile/byod-t-mobile-data-and-apn-settings; https://www.t-mobile.com/support/tutorials/device/apple/iphone-x/topic/connections-amp-network/apn-and-data-settings.
[1f] an interface to allow a user to augment the differential traffic control policy for the first one or more applications but not for the	The Accused Instrumentalities include "an interface to allow a user to augment the differential traffic control policy for the first one or more applications but not for the second one or more applications and/or services." For example, devices sold or used by T-Mobile include an interface which allow users to augment policies and settings for some applications and/or services, but not all applications and/or services (*e.g.*, system services).

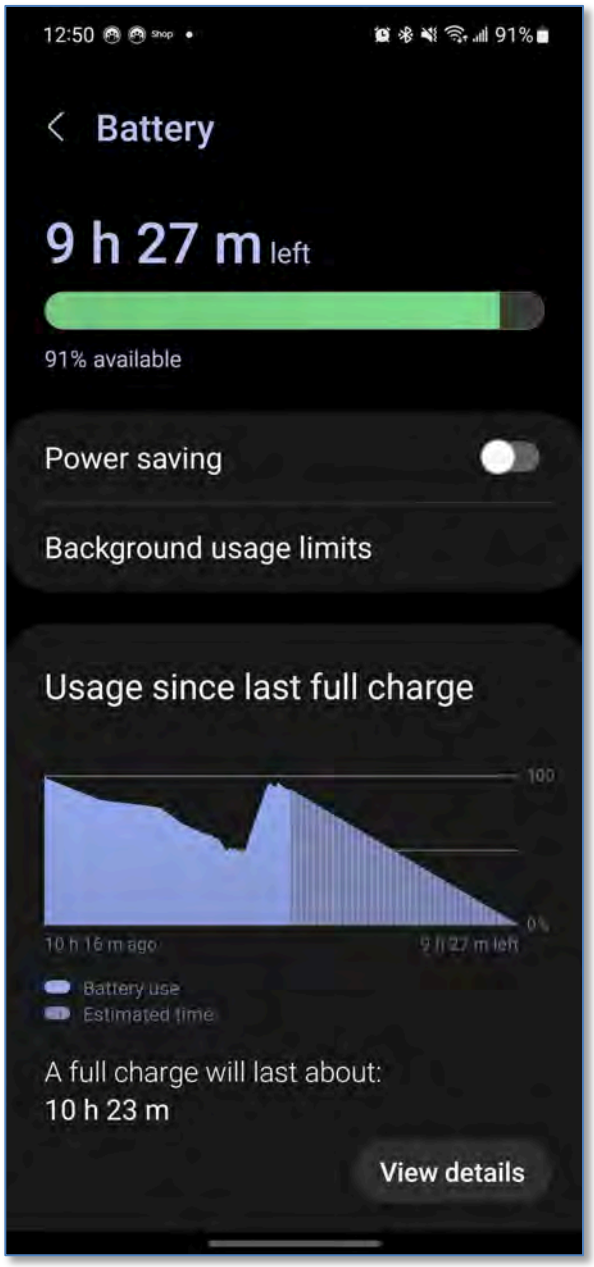
Claim	Public Documentation
second one or more applications and/or services; and	*See, e.g.*, https://www.t-mobile.com/support/public-files/attachments/samsung/samsung-galaxy-s21-fe-5g/Samsung%20Galaxy%20S21%20FE%205G_English%20User%20Guide_FINAL2.pdf: **Data usage** Check your current mobile and Wi-Fi data usage. You can also customize warnings and limits. ○ From Settings, tap Connections > Data usage. **Turn on Data saver** Use Data saver to reduce your data consumption by preventing selected apps from sending or receiving data in the background. 1. From Settings, tap Connections > Data usage > Data saver. 2. Tap to turn on Data saver. • To allow some apps to have unrestricted data usage, tap **Allowed to use data while Data saver is on**, and tap next to each app to specify restrictions. ; https://www.samsung.com/us/support/answer/ANS00079018/:

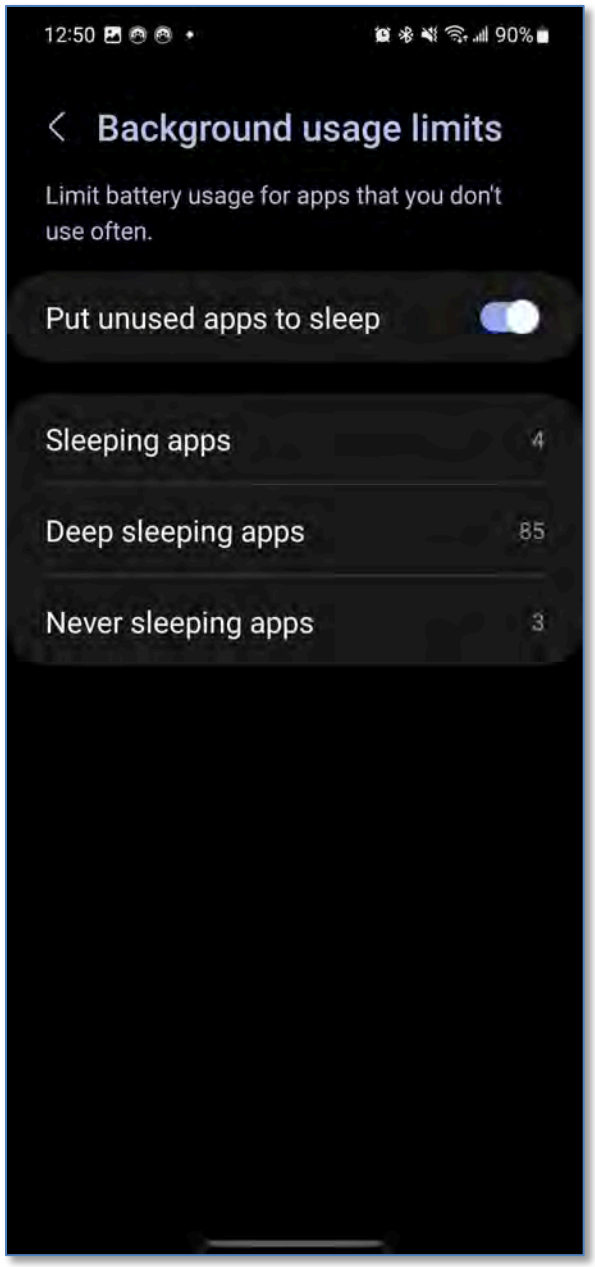
Claim	Public Documentation
	 ; https://www.samsung.com/ae/support/mobile-devices/android-pie-what-is-the-data-saver-feature/:

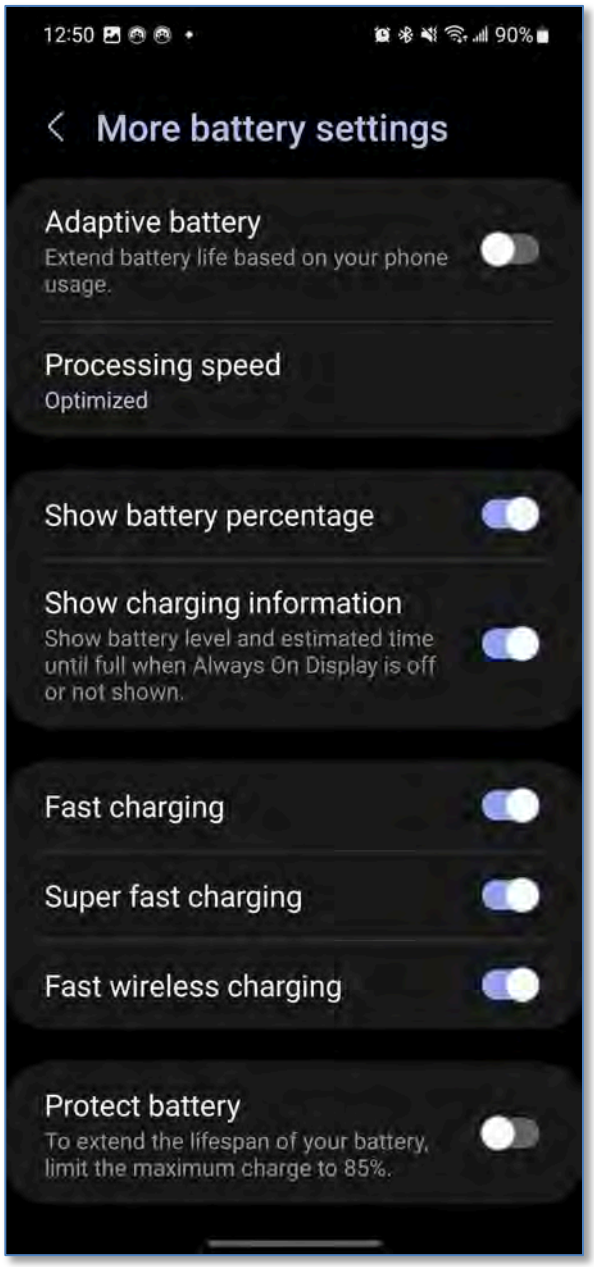
Claim	Public Documentation
	

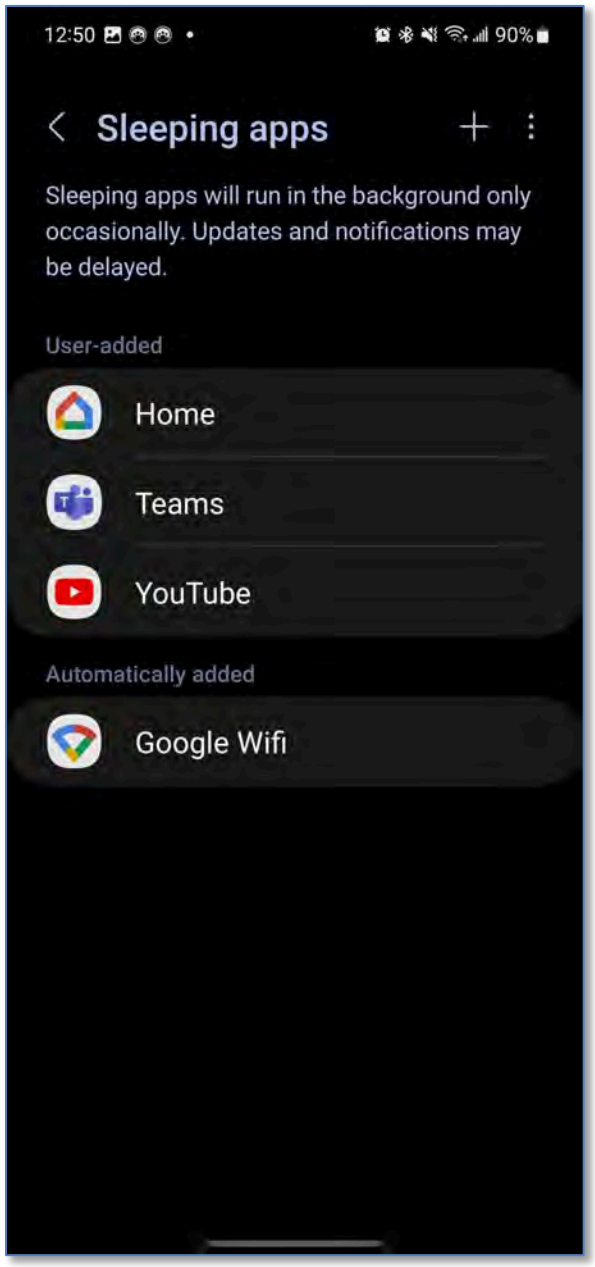
Claim	Public Documentation
	 ; https://www.samsung.com/us/support/answer/ANS00078987/:

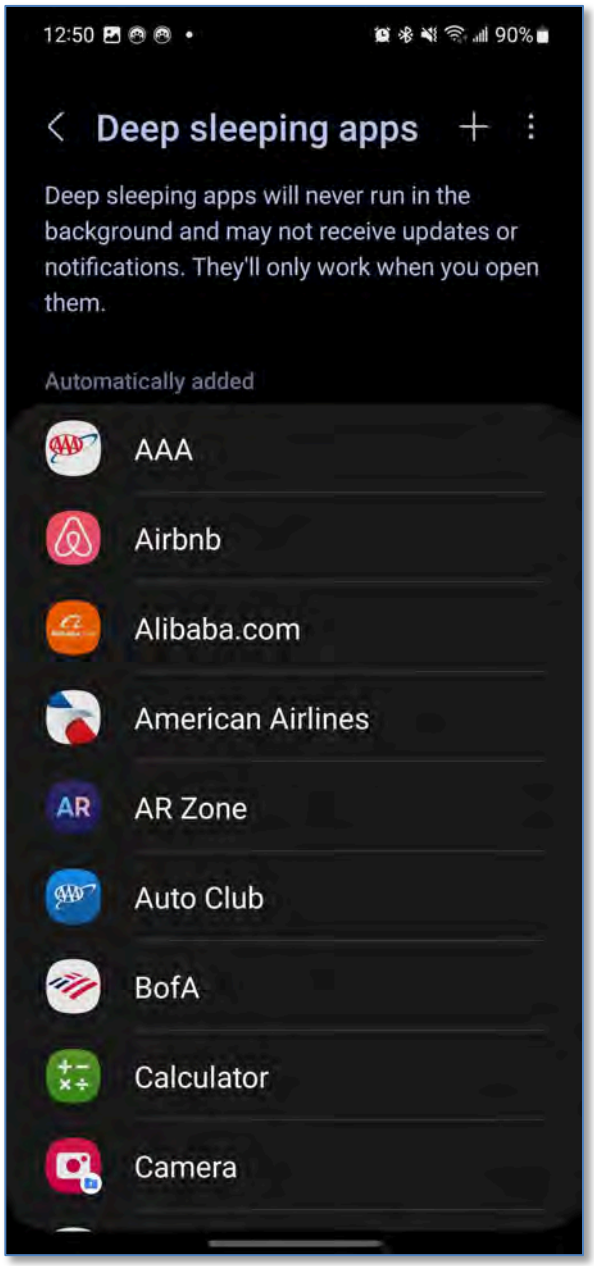
Claim	Public Documentation
	 ; *see also* the exemplary screenshots below:

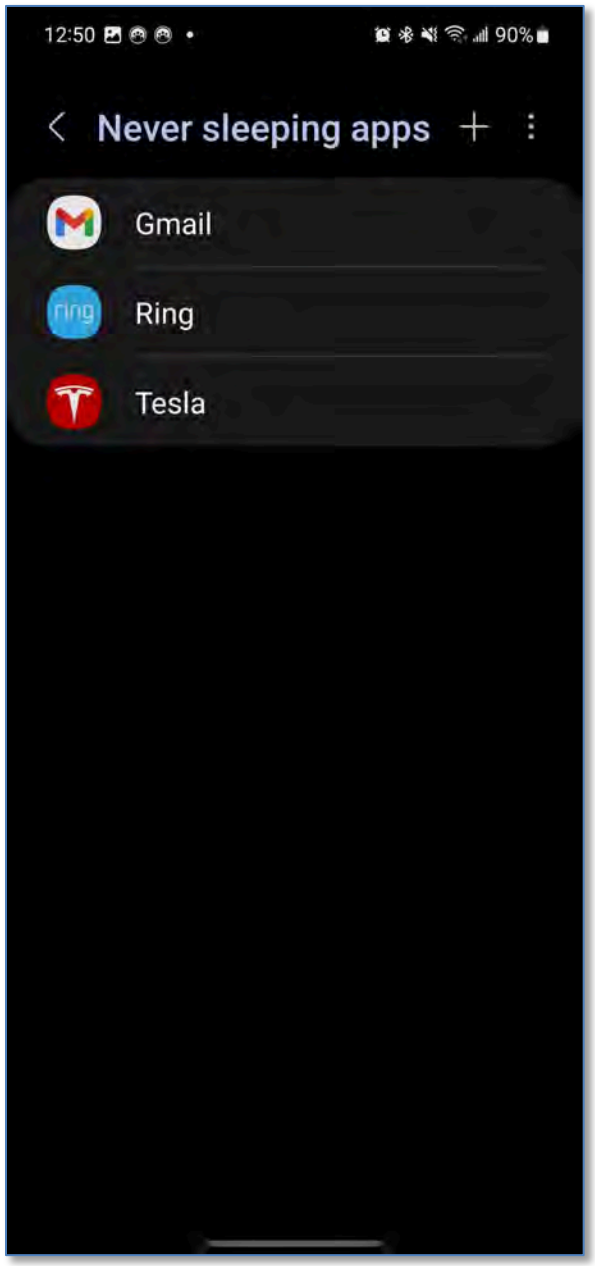

12:50
91%
Battery
9 h 27 m left
91% available
Power saving
Background usage limits
Usage since last full charge
100
0%
10 h 16 m ago
9 h 27 m left
Battery use
Estimated time
A full charge will last about:
10 h 23 m
View details

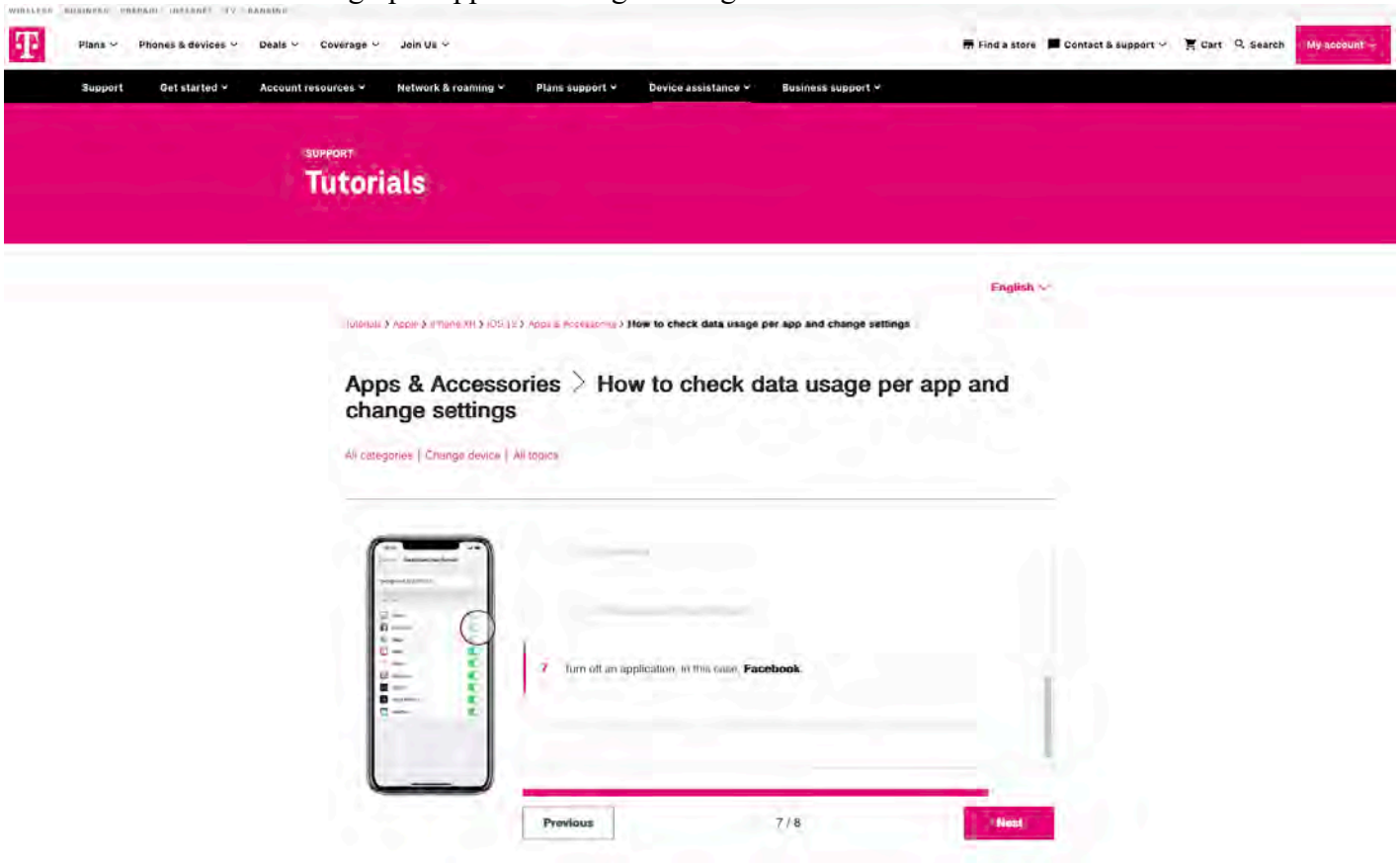

12:50
90%
Background usage limits
Limit battery usage for apps that you don't use often.
Put unused apps to sleep
Sleeping apps 4
Deep sleeping apps 85
Never sleeping apps 3

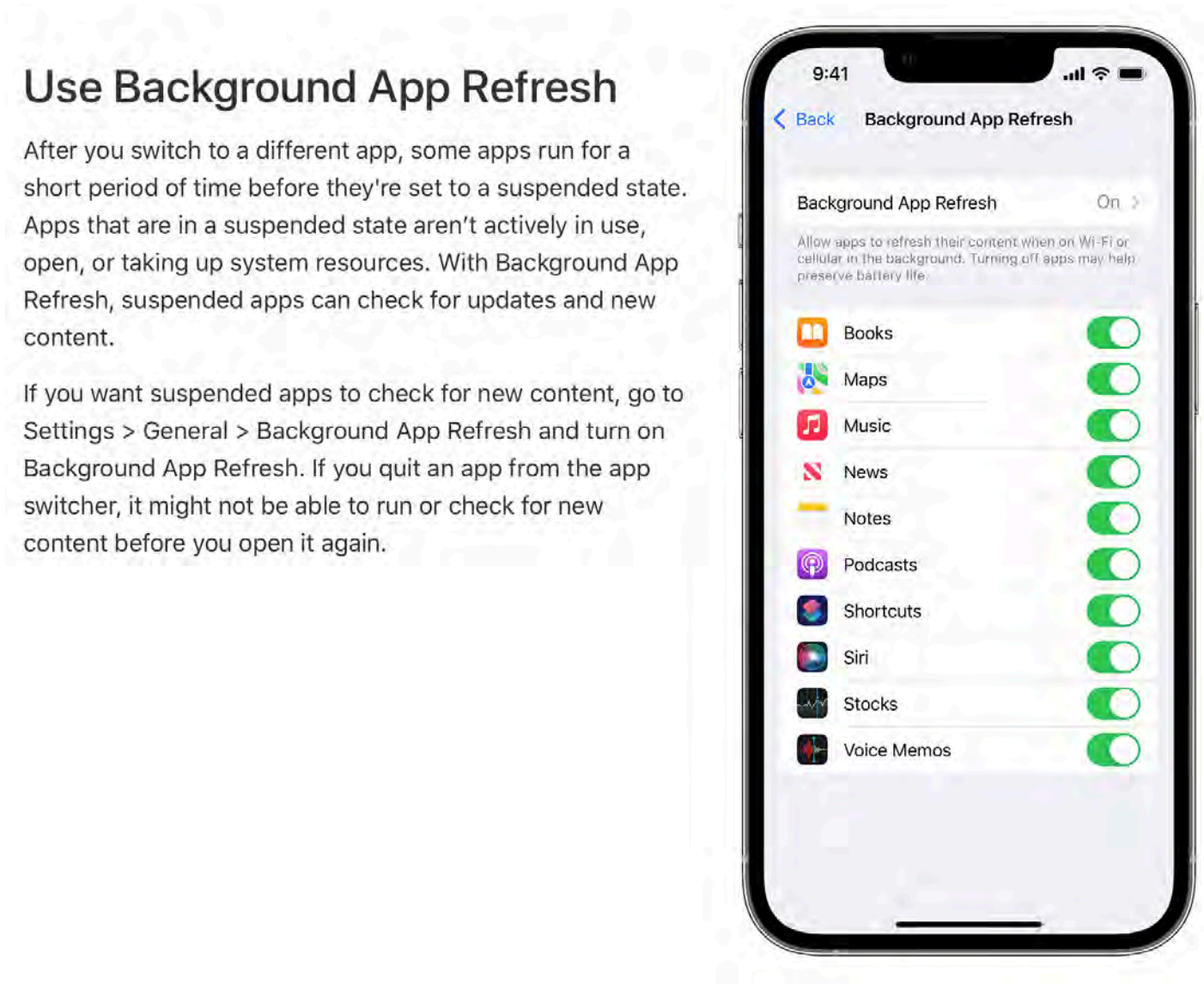

12:50
90%
More battery settings
Adaptive battery
Extend battery life based on your phone usage.
Processing speed
Optimized
Show battery percentage
Show charging information
Show battery level and estimated time until full when Always On Display is off or not shown.
Fast charging
Super fast charging
Fast wireless charging
Protect battery
To extend the lifespan of your battery, limit the maximum charge to 85%.


12:50
90%
Sleeping apps
Sleeping apps will run in the background only occasionally. Updates and notifications may be delayed.
User-added
Home
Teams
YouTube
Automatically added
Google Wifi


12:50
90%
Deep sleeping apps
Deep sleeping apps will never run in the background and may not receive updates or notifications. They'll only work when you open them.
Automatically added
AAA
Airbnb
Alibaba.com
American Airlines
AR Zone
Auto Club
BofA
Calculator
Camera


12:50
90%
Never sleeping apps
Gmail
Ring
Tesla

Claim	Public Documentation
	See also e.g., https://www.t-mobile.com/support/tutorials/device/apple/iphone-xr/topic/apps-amp-accessories/how-to-check-data-usage-per-app-and-change-settings/7  ; https://support.apple.com/en-us/HT202070:

Claim	Public Documentation
	 https://support.apple.com/en-us/HT205234:

Use Low Power Mode to save battery life on your iPhone or iPad

Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

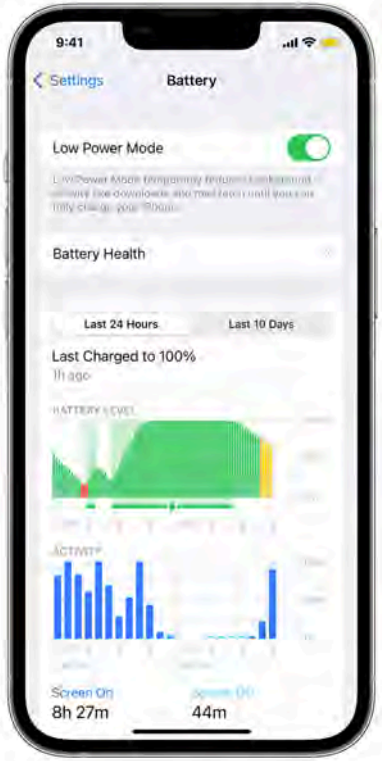
To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.

Low Power Mode reduces or affects these features:

- 5G (except for video streaming) on iPhone 12 and iPhone 13 models[1]
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display[2]
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.

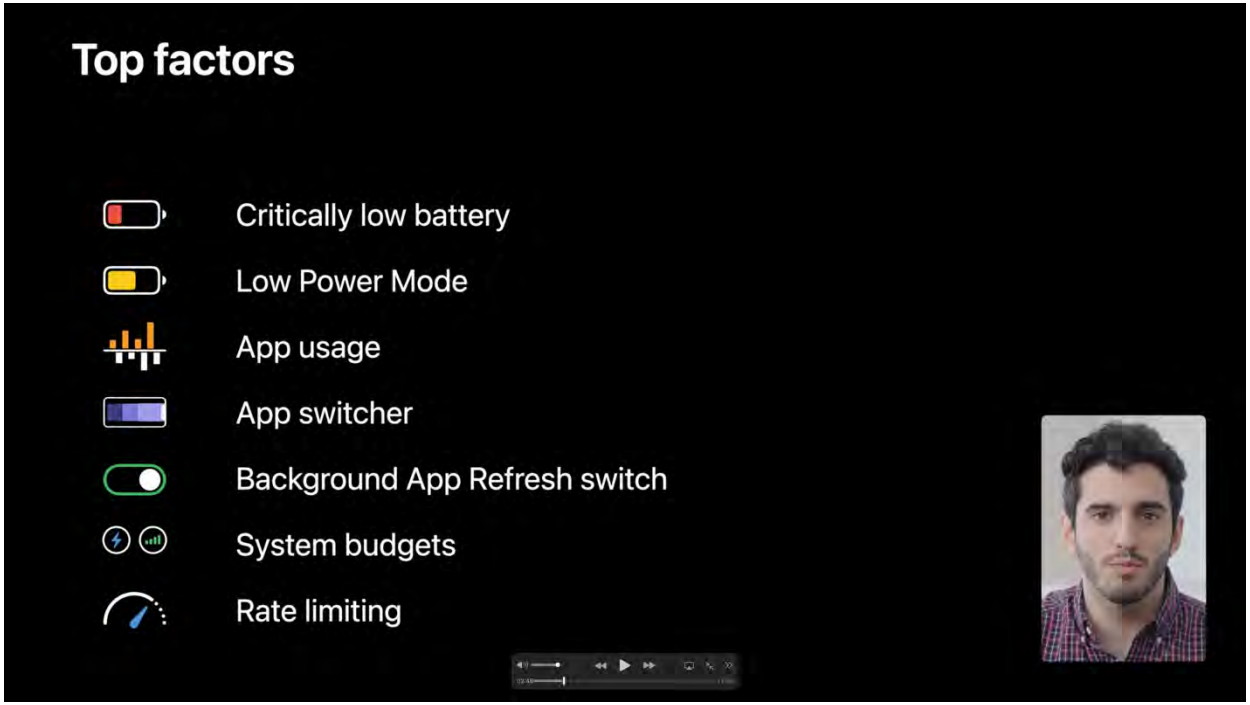


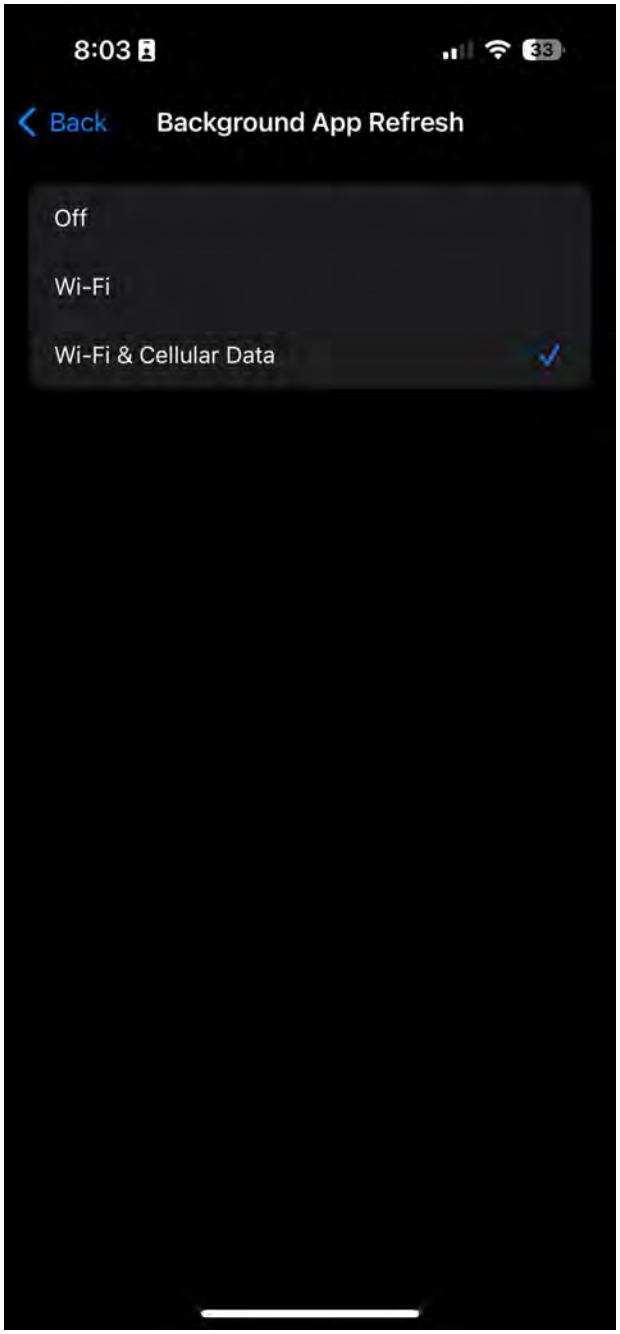
1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

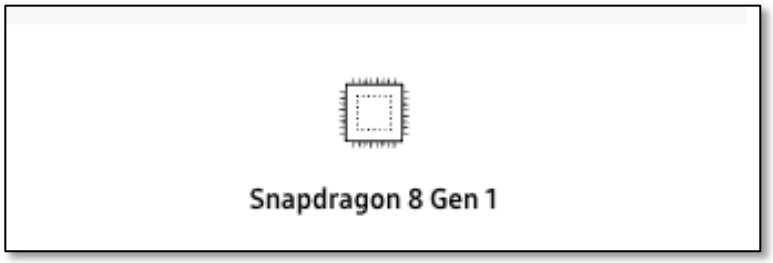
Claim	Public Documentation
	https://www.apple.com/batteries/maximizing-performance/: **View Battery Usage information** With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery. Here are the messages you may see listed below the apps you've been using: **Background Activity.** This indicates that the battery was used by the app while it was in the background — that is, while you were using another app. • To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely. • If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data. ; https://developer.apple.com/videos/play/wwdc2020/10063:

Claim	Public Documentation

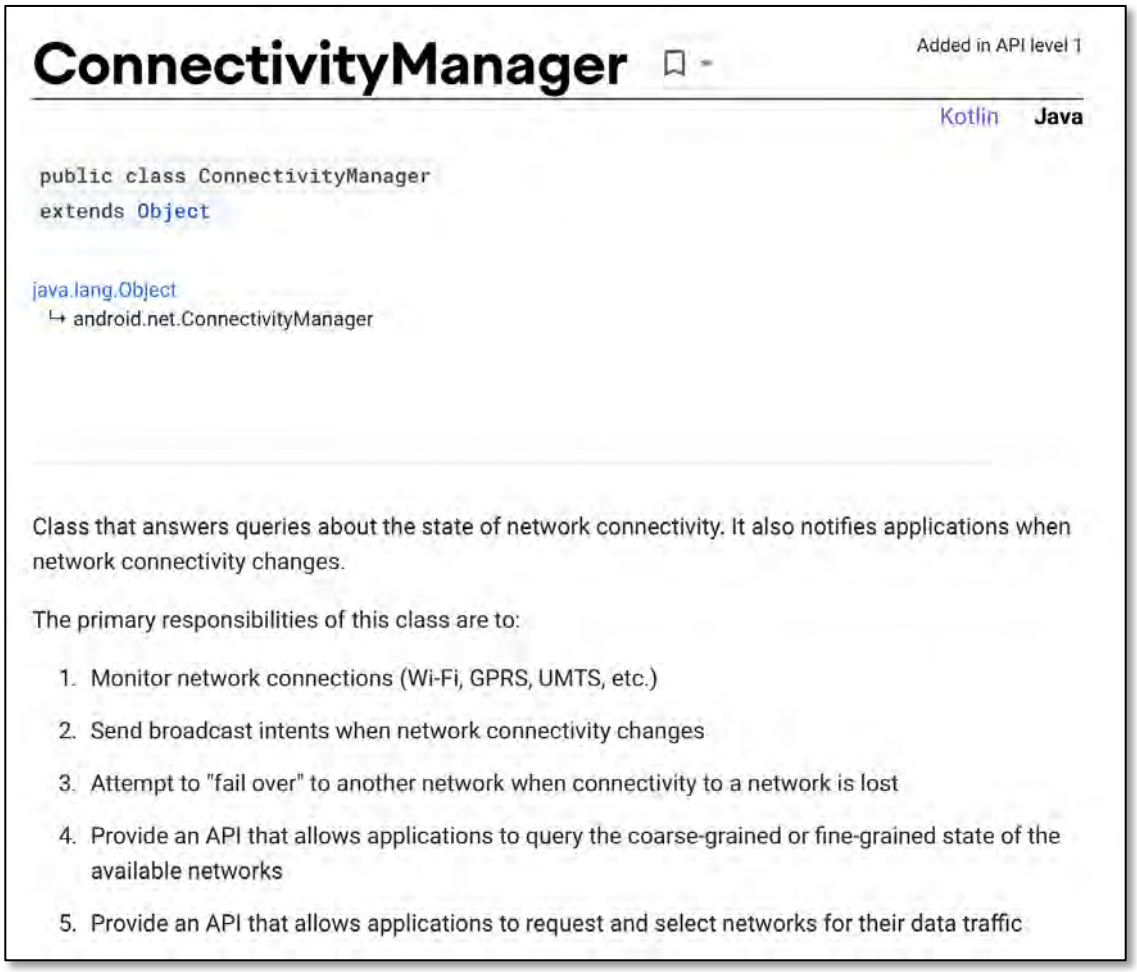
Claim	Public Documentation
	 ; *see also* exemplary screen shots below:


8:03
33
Back
Background App Refresh
Off
Wi-Fi
Wi-Fi & Cellular Data

Claim	Public Documentation
	 See also, e.g., https://www.t-mobile.com/apps/t-mobile-app; https://www.t-mobile.com/apps/t-mobile-family-mode.
[1g] one or more processors configured to	The Accused Instrumentalities include "one or more processors." For example, the Galaxy S22 has either a Snapdragon (in the United States) or Exynos (in Korea) architecture-based application processor. *See, e.g.*, https://www.samsung.com/us/smartphones/galaxy-s22/buy/galaxy-s22-128gb-unlocked-sm-s901uzkaxaa/:

Claim	Public Documentation
	 For further example, the Apple iPhone 15 Pro model has a A17 Pro Chip. *See, e.g.*, https://www.apple.com/iphone-15-pro/specs/

[1h] classify a wireless network to which the device currently connects in order to communicate data for Internet service activities as at least one of a plurality of network types that the device can connect with,	The Accused Instrumentalities "classify a wireless network to which the device currently connects in order to communicate data for Internet service activities as at least one of a plurality of network types that the device can connect with." For example, devices sold and used by T-Mobile classify wireless network connections for communicating internet service activities. *See, e.g.*, https://developer.android.com/reference/android/net/ConnectivityManager:



ConnectivityManager

Added in API level 1

Kotlin **Java**

```
public class ConnectivityManager
extends Object
```

java.lang.Object
↳ android.net.ConnectivityManager

Class that answers queries about the state of network connectivity. It also notifies applications when network connectivity changes.

The primary responsibilities of this class are to:

1. Monitor network connections (Wi-Fi, GPRS, UMTS, etc.)
2. Send broadcast intents when network connectivity changes
3. Attempt to "fail over" to another network when connectivity to a network is lost
4. Provide an API that allows applications to query the coarse-grained or fine-grained state of the available networks
5. Provide an API that allows applications to request and select networks for their data traffic

https://developer.android.com/training/monitoring-device-state/connectivity-status-type; https://www.samsung.com/us/support/answer/ANS00079018/; https://www.samsung.com/ae/support/mobile-devices/android-pie-what-is-the-data-saver-feature/; https://www.samsung.com/us/support/answer/ANS00078987/; https://developer.android.com/training/basics/network-ops/data-saver; https://developer.android.com/training/monitoring-device-state/doze-standby; https://developer.android.com/topic/performance/appstandby:

App Standby Buckets

Android 9 (API level 28) and higher support **App Standby Buckets**. App Standby Buckets help the system prioritize apps' requests for resources based on how recently and how frequently the apps are used. Based on app usage patterns, each app is placed in one of five priority **buckets**. The system limits the device resources available to each app based on which bucket the app is in.

Priority buckets

The system dynamically assigns each app to a priority bucket, reassigning the apps as needed. The system may rely on a preloaded app that uses machine learning to determine how likely each app is to be used, and assigns apps to the appropriate buckets. If the system app is not present on a device, the system defaults to sorting apps based on how recently they were used. More active apps are assigned to buckets that give the apps higher priority, making more system resources available to the app. In particular, the bucket determines how frequently the app's jobs run, and how often the app can trigger alarms. These restrictions apply only while the device is on battery power; the system does not impose these restrictions on apps while the device is charging.

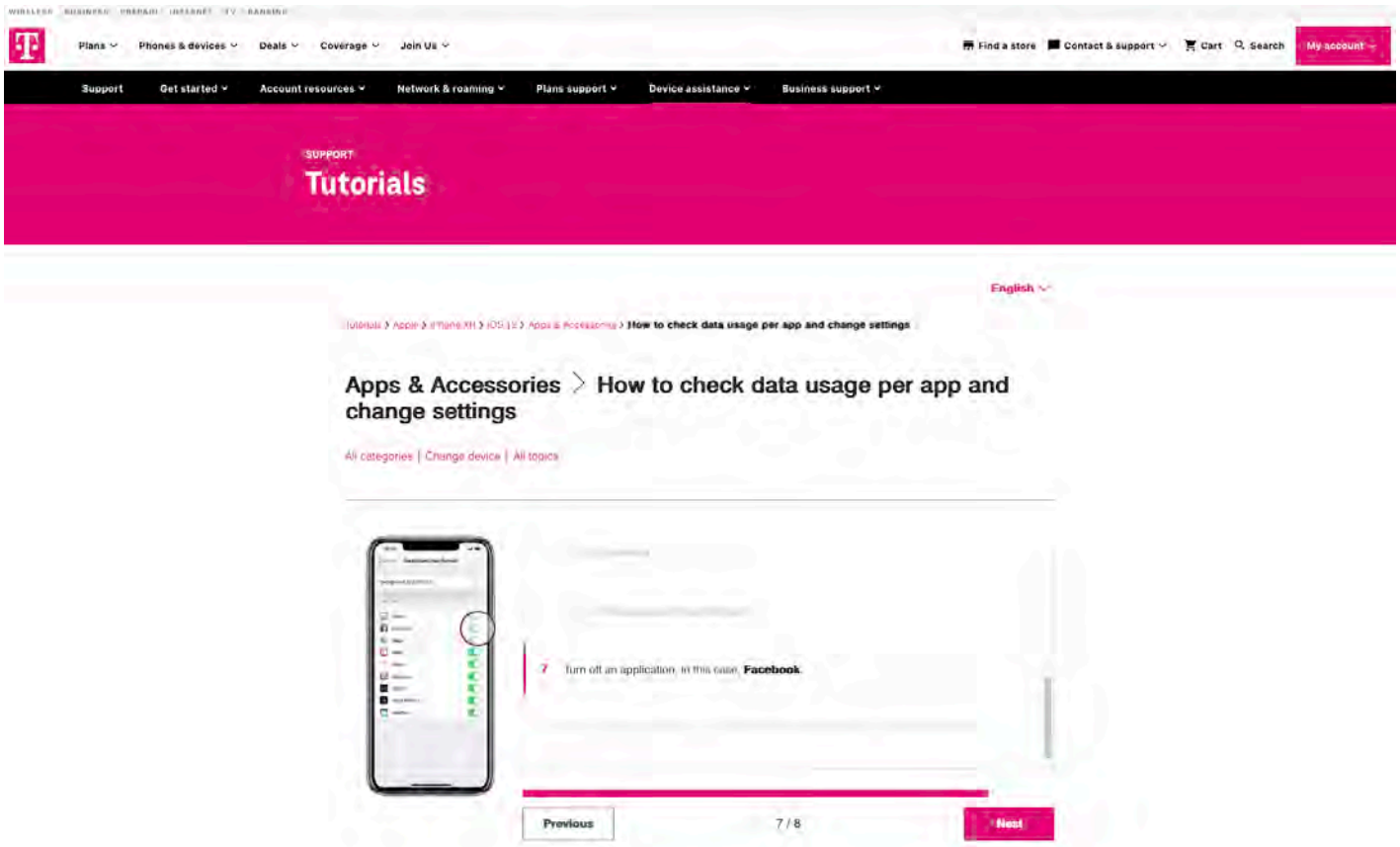
Note: Every manufacturer can set their own criteria for how non-active apps are assigned to buckets. You should not try to influence which bucket your app is assigned to. Instead, focus on making sure your app behaves well in whatever bucket it might be in. Your app can find out what bucket it's currently in by calling `UsageStatsManager.getAppStandbyBucket()`.

The buckets are:

1. Active: App is currently being used or was very recently used.
2. Working set: App is in regular use.
3. Frequent: App is often used, but not every day.
4. Rare: App is not frequently used.
5. Restricted: App consumes a great deal of system resources, or may exhibit undesirable behavior.

In addition, there's a special **never** bucket for apps that have been installed but have never been run. The system imposes severe restrictions on these apps.

Claim	Public Documentation
	 ; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler; https://developer.android.com/guide/background/persistent; https://developer.android.com/guide/components/services; https://developer.android.com/guide/components/activities/intro-activities; https://developer.android.com/reference/java/net/URLConnection; https://developer.android.com/training/articles/security-ssl; https://developer.android.com/reference/android/net/DnsResolver; https://developer.android.com/guide/topics/media; https://developer.android.com/media; https://developer.android.com/guide/topics/media/platform/mediaplayer; https://developer.apple.com/documentation/networkextension/dns_settings; https://techshift.net/does-data-saver-apply-to-wi-fi/: "**Does data saver apply to Wi-Fi?** Does data saver affect WiFi? **No, it doesn't**. Data saver only restricts the apps from using mobile data. While you are on WiFi, your phone's data saver won't affect it." ; https://www.technipages.com/how-to-give-android-apps-unrestricted-data-access-data-saver-on: "The Data Saver option is only when you're not on WiFi and affects how you see your content." *See also e.g.*, https://www.t-mobile.com/support/tutorials/device/apple/iphone-xr/topic/apps-amp-accessories/how-to-check-data-usage-per-app-and-change-settings/7

Claim	Public Documentation
	 ; https://support.apple.com/en-us/HT202070; https://support.apple.com/en-us/HT205234;

Use Low Power Mode to save battery life on your iPhone or iPad

Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

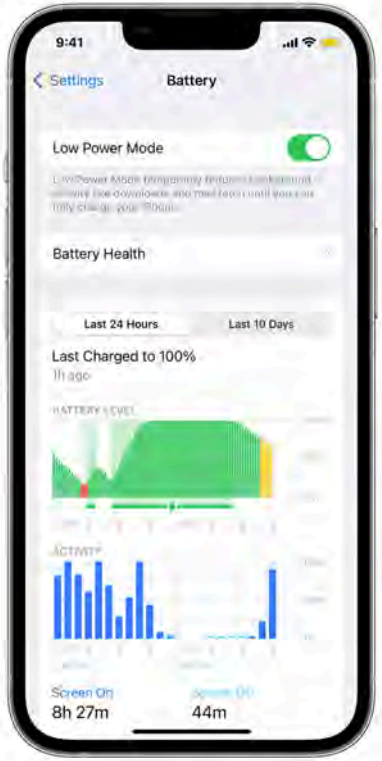
To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.

Low Power Mode reduces or affects these features:

- 5G (except for video streaming) on iPhone 12 and iPhone 13 models[1]
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display[2]
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.



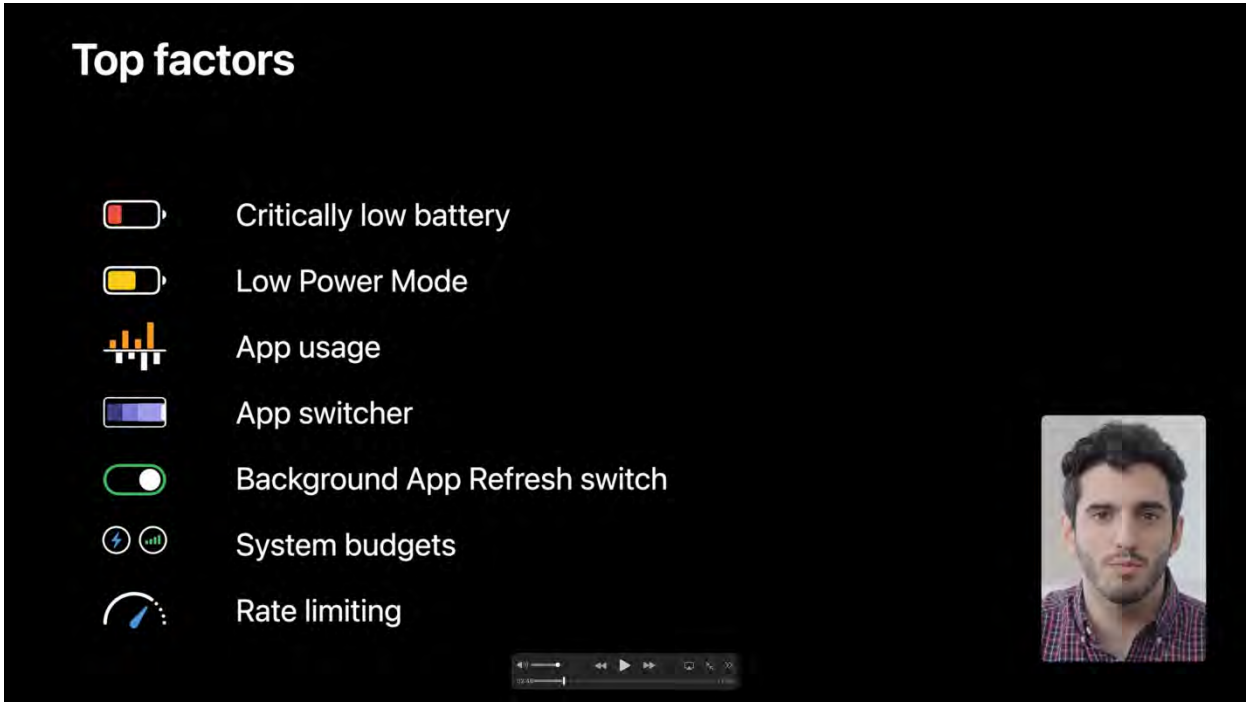
1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

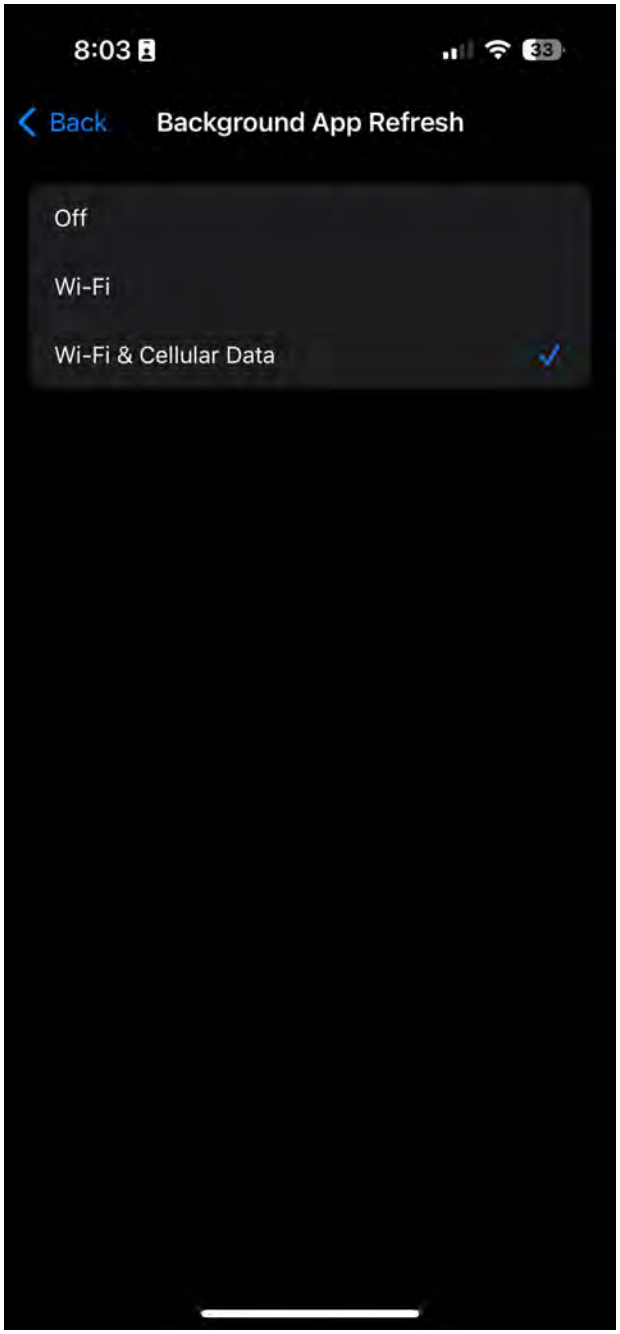
2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

Claim	Public Documentation
	https://www.apple.com/batteries/maximizing-performance/: **View Battery Usage information** With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery. Here are the messages you may see listed below the apps you've been using: **Background Activity.** This indicates that the battery was used by the app while it was in the background — that is, while you were using another app. • To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely. • If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data. ; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/; https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/prepar-

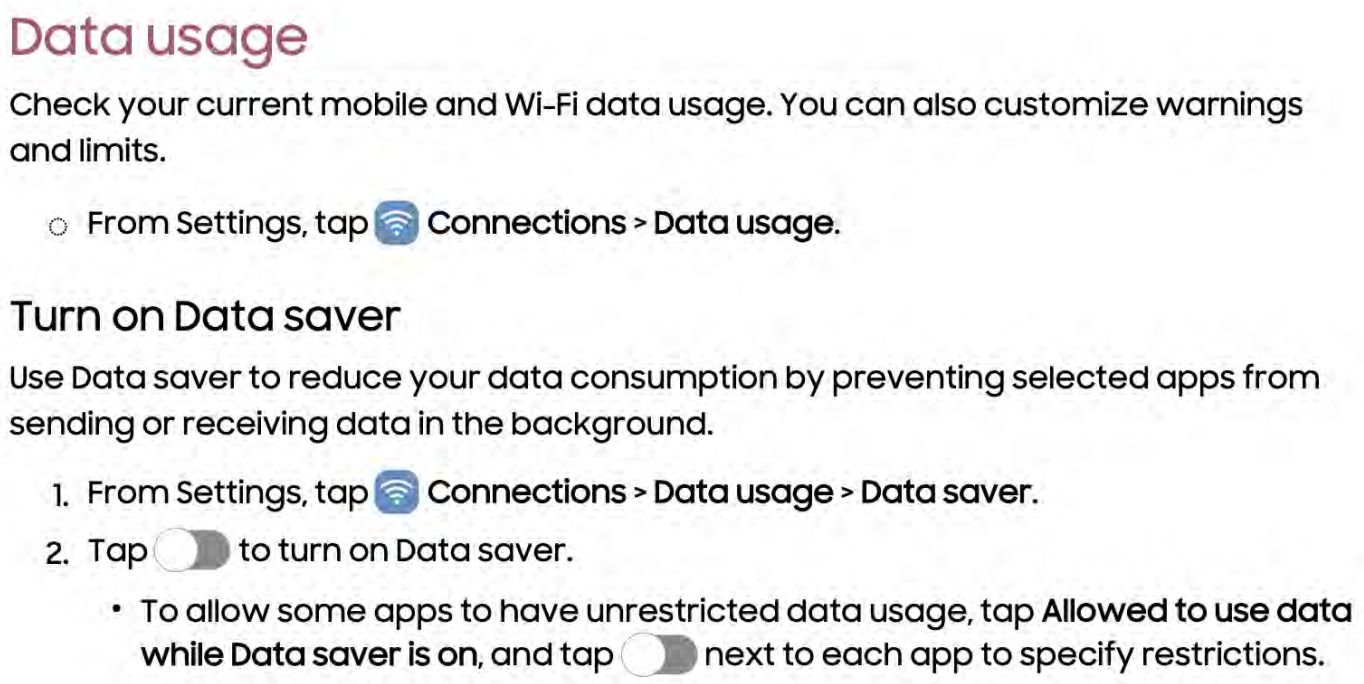
Claim	Public Documentation
	ing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks https://developer.apple.com/documentation/backgroundtasks/bgapprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocessingtask; https://developer.apple.com/documentation/backgroundtasks/bgtask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate; https://developer.apple.com/documentation/uikit/uiapplication/state; https://developer.apple.com/documentation/foundation/url_loading_system; https://developer.apple.com/documentation/foundation/urlsession; https://developer.apple.com/documentation/devicemanagement/mail; https://developer.apple.com/documentation/security/secure_transport/using_the_secure_socket_layer_for_network_communication; https://developer.apple.com/documentation/networkextension/personal_vpn; https://developer.apple.com/documentation/foundation/nsproxy; https://developer.apple.com/documentation/messages; https://developer.apple.com/documentation/avfoundation/avplayer; https://developer.apple.com/documentation/avfoundation/media_playback/configuring_your_app_for_media_playback; https://developer.apple.com/videos/play/wwdc2019/707/; https://developer.apple.com/videos/play/wwdc2020/10063:

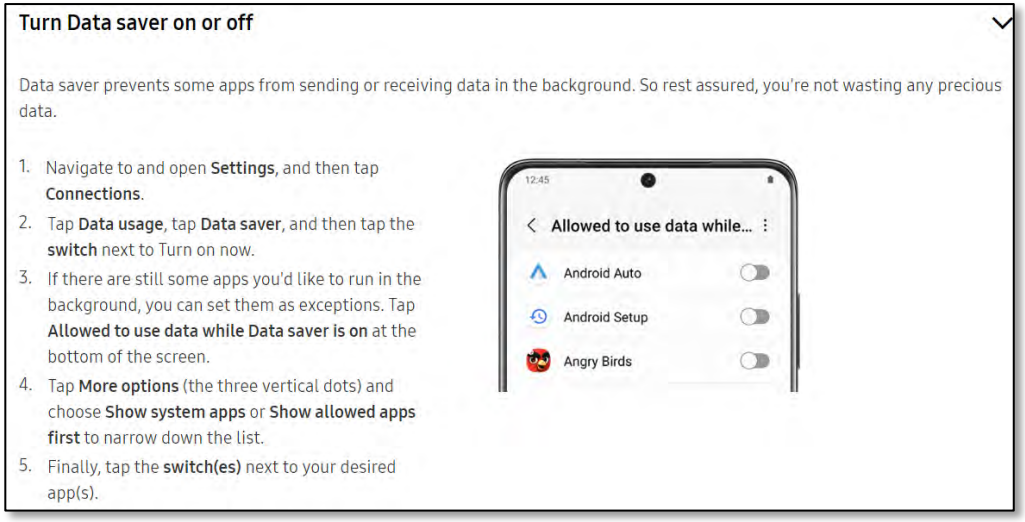
Claim	Public Documentation

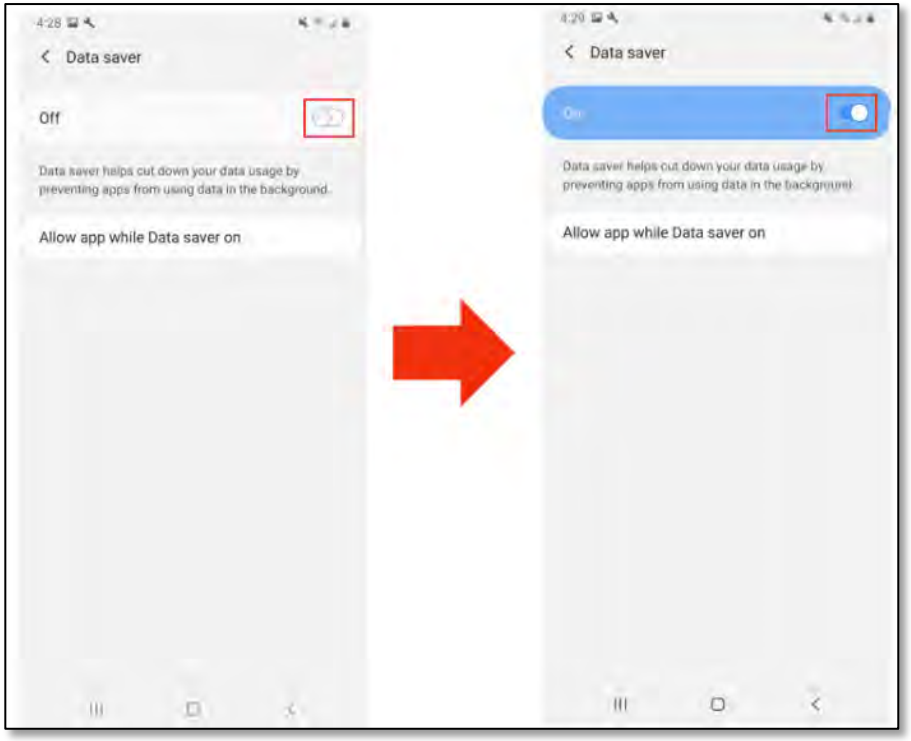
Claim	Public Documentation
	 ; *see also* exemplary screen shots below:

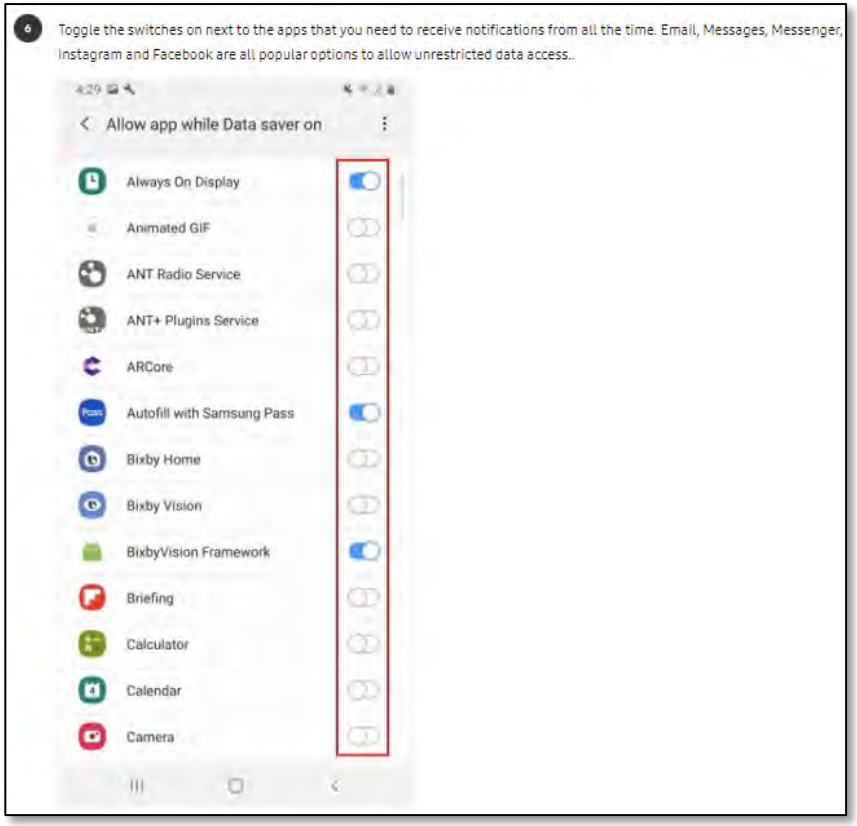

8:03
33
Back
Background App Refresh
Off
Wi-Fi
Wi-Fi & Cellular Data

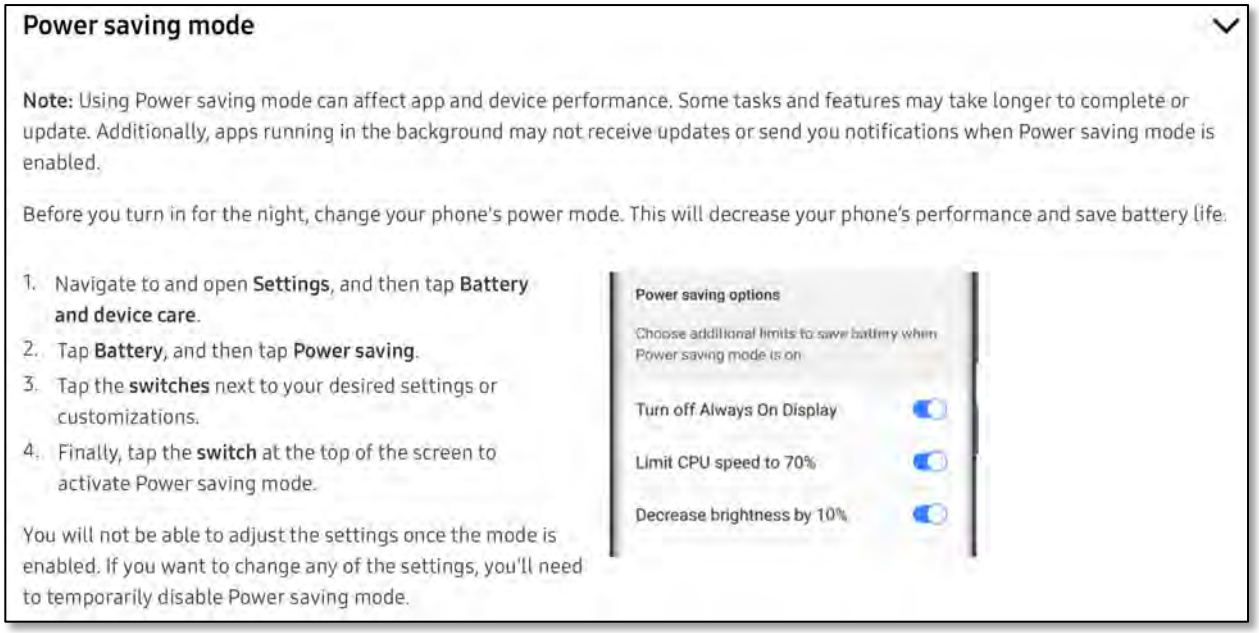
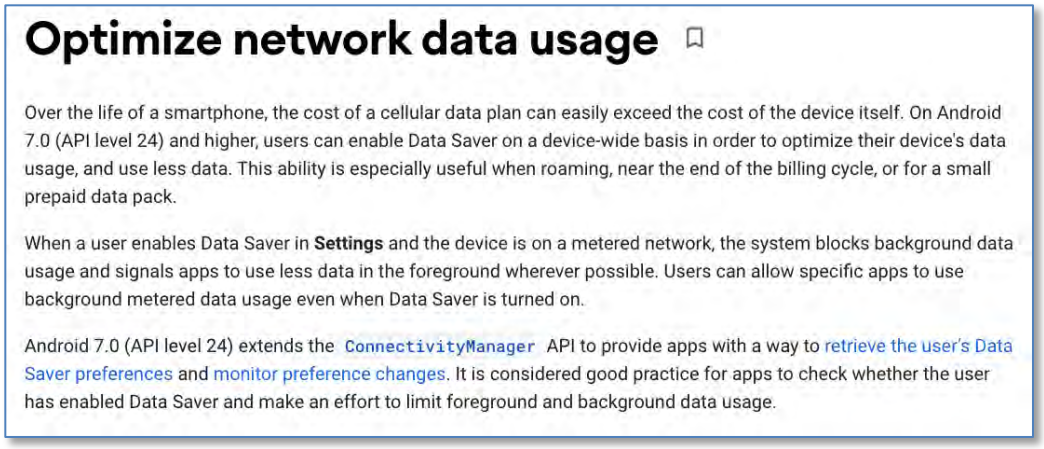
Claim	Public Documentation
[1i] classify whether a particular application capable of both interacting with the user in a user interface foreground of the device, and at least some Internet service activities when not interacting with the user in the device user interface foreground,	The Accused Instrumentalities "classify whether a particular application capable of both interacting with the user in a user interface foreground of the device, and at least some Internet service activities when not interacting with the user in the device user interface foreground." For example, phones and tablets sold and used by T-Mobile classify applications and internet service activities in both foreground and background. *See, e.g.*, https://www.t-mobile.com/support/public-files/attachments/samsung/samsung-galaxy-s21-fe-5g/Samsung%20Galaxy%20S21%20FE%205G_English%20User%20Guide_FINAL2.pdf:

Claim	Public Documentation
	 ; https://www.samsung.com/us/support/answer/ANS00079018/:

Claim	Public Documentation
	 ; https://www.samsung.com/ae/support/mobile-devices/android-pie-what-is-the-data-saver-feature/:

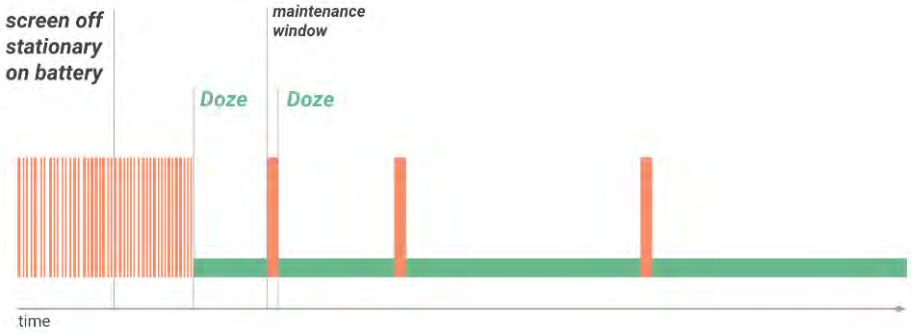
Claim	Public Documentation
	

Claim	Public Documentation
	 ; https://www.samsung.com/us/support/answer/ANS00078987/:

Claim	Public Documentation
	 ; https://developer.android.com/training/basics/network-ops/data-saver: 

Claim	Public Documentation

	Check data saver preferences
	On Android 7.0 (API level 24) and higher, apps can use the `ConnectivityManager` API to determine what data usage restrictions are being applied. The `getRestrictBackgroundStatus()` method returns one of the following values:
	`RESTRICT_BACKGROUND_STATUS_DISABLED`
	Data Saver is disabled.
	`RESTRICT_BACKGROUND_STATUS_ENABLED`
	The user has enabled Data Saver for this app. Apps should make an effort to limit data usage in the foreground and gracefully handle restrictions to background data usage.
	`RESTRICT_BACKGROUND_STATUS_WHITELISTED`
	The user has enabled Data Saver but the app is allowed to bypass it. Apps should still make an effort to limit foreground and background data usage.
	Limit data usage whenever the device is connected to a metered network, even if Data Saver is disabled or the app is allowed to bypass it. The following sample code uses `ConnectivityManager.isActiveNetworkMetered()` and `ConnectivityManager.getRestrictBackgroundStatus()` to determine how much data the app should use:
	; https://developer.android.com/training/monitoring-device-state/doze-standby:
	Optimize for Doze and App Standby
	Starting from Android 6.0 (API level 23), Android introduces two power-saving features that extend battery life for users by managing how apps behave when a device is not connected to a power source. *Doze* reduces battery consumption by deferring background CPU and network activity for apps when the device is unused for long periods of time. *App Standby* defers background network activity for apps with which the user has not recently interacted.
	While the device is in Doze, apps' access to certain battery-intensive resources is deferred until maintenance windows. The specific restrictions are listed in Power Management Restrictions.
	Doze and App Standby manage the behavior of all apps running on Android 6.0 or higher, regardless whether they are specifically targeting API level 23. To ensure the best experience for users, test your app in Doze and App Standby modes and make any necessary adjustments to your code. The sections below provide details.

Claim	Public Documentation
	Understanding Doze If a user leaves a device unplugged and stationary for a period of time, with the screen off, the device enters Doze mode. In Doze mode, the system attempts to conserve battery by restricting apps' access to network and CPU-intensive services. It also prevents apps from accessing the network and defers their jobs, syncs, and standard alarms. Periodically, the system exits Doze for a brief time to let apps complete their deferred activities. During this *maintenance window*, the system runs all pending syncs, jobs, and alarms, and lets apps access the network.  **Figure 1.** Doze provides a recurring maintenance window for apps to use the network and handle pending activities. At the conclusion of each maintenance window, the system again enters Doze, suspending network access and deferring jobs, syncs, and alarms. Over time, the system schedules maintenance windows less and less frequently, helping to reduce battery consumption in cases of longer-term inactivity when the device is not connected to a charger. As soon as the user wakes the device by moving it, turning on the screen, or connecting a charger, the system exits Doze and all apps return to normal activity. The Doze restriction on network access is also likely to affect your app, especially if the app relies on real-time messages such as tickles or notifications. If your app requires a persistent connection to the network to receive messages, you should use Firebase Cloud Messaging (FCM) if possible. ; https://developer.android.com/topic/performance/appstandby:

App Standby Buckets

Android 9 (API level 28) and higher support **App Standby Buckets**. App Standby Buckets help the system prioritize apps' requests for resources based on how recently and how frequently the apps are used. Based on app usage patterns, each app is placed in one of five priority **buckets**. The system limits the device resources available to each app based on which bucket the app is in.

Priority buckets

The system dynamically assigns each app to a priority bucket, reassigning the apps as needed. The system may rely on a preloaded app that uses machine learning to determine how likely each app is to be used, and assigns apps to the appropriate buckets. If the system app is not present on a device, the system defaults to sorting apps based on how recently they were used. More active apps are assigned to buckets that give the apps higher priority, making more system resources available to the app. In particular, the bucket determines how frequently the app's jobs run, and how often the app can trigger alarms. These restrictions apply only while the device is on battery power; the system does not impose these restrictions on apps while the device is charging.

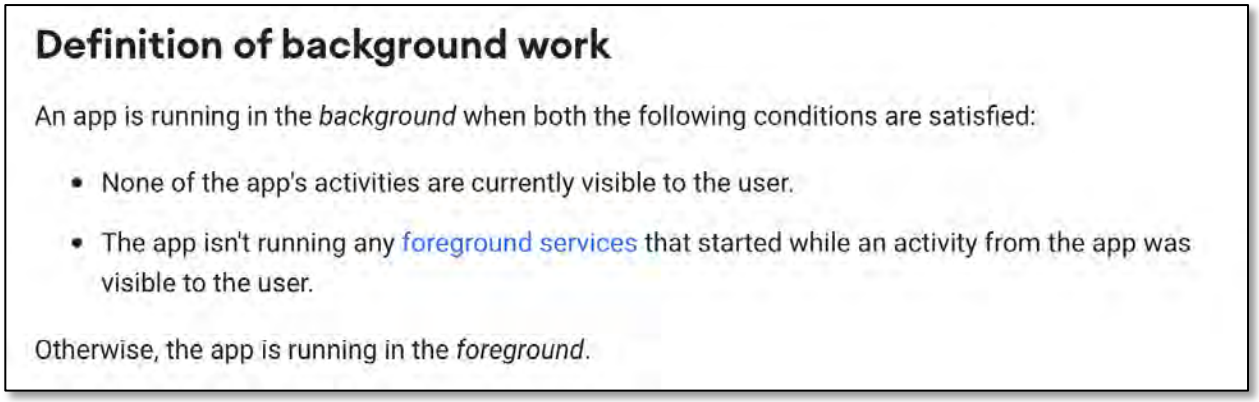
Note: Every manufacturer can set their own criteria for how non-active apps are assigned to buckets. You should not try to influence which bucket your app is assigned to. Instead, focus on making sure your app behaves well in whatever bucket it might be in. Your app can find out what bucket it's currently in by calling `UsageStatsManager.getAppStandbyBucket()`.

The buckets are:

1. Active: App is currently being used or was very recently used.
2. Working set: App is in regular use.
3. Frequent: App is often used, but not every day.
4. Rare: App is not frequently used.
5. Restricted: App consumes a great deal of system resources, or may exhibit undesirable behavior.

In addition, there's a special **never** bucket for apps that have been installed but have never been run. The system imposes severe restrictions on these apps.

Claim	Public Documentation
	; https://developer.android.com/topic/performance/power/power-details; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler; https://developer.android.com/guide/background/persistent; https://developer.android.com/guide/components/activities/process-lifecycle: 1. A **foreground process** is one that is required for what the user is currently doing. Various application components can cause its containing process to be considered foreground in different ways. A process is considered to be in the foreground if any of the following conditions hold: • It is running an `Activity` at the top of the screen that the user is interacting with (its `onResume()` method has been called). • It has a `BroadcastReceiver` that is currently running (its `BroadcastReceiver.onReceive()` method is executing). • It has a `Service` that is currently executing code in one of its callbacks (`Service.onCreate()`, `Service.onStart()`, or `Service.onDestroy()`). There will only ever be a few such processes in the system, and these will only be killed as a last resort if memory is so low that not even these processes can continue to run. Generally, at this point, the device has reached a memory paging state, so this action is required in order to keep the user interface responsive. ; https://developer.android.com/guide/background:

Claim	Public Documentation
	 ; https://developer.android.com/guide/components/services;

Types of Services

These are the three different types of services:

Foreground

A foreground service performs some operation that is noticeable to the user. For example, an audio app would use a foreground service to play an audio track. Foreground services must display a Notification. Foreground services continue running even when the user isn't interacting with the app.

When you use a foreground service, you must display a notification so that users are actively aware that the service is running. This notification cannot be dismissed unless the service is either stopped or removed from the foreground.

Learn more about how to configure foreground services in your app.

★ **Note:** The WorkManager API offers a flexible way of scheduling tasks, and is able to run these jobs as foreground services if needed. In many cases, using WorkManager is preferable to using foreground services directly.

Background

A background service performs an operation that isn't directly noticed by the user. For example, if an app used a service to compact its storage, that would usually be a background service.

★ **Note:** If your app targets API level 26 or higher, the system imposes restrictions on running background services when the app itself isn't in the foreground. In most situations, for example, you shouldn't access location information from the background. Instead, schedule tasks using WorkManager.

Bound

A service is *bound* when an application component binds to it by calling `bindService()`. A bound service offers a client-server interface that allows components to interact with the service, send requests, receive results, and even do so across processes with interprocess communication (IPC). A bound service runs only as long as another application component is bound to it. Multiple components can bind to the service at once, but when all of them unbind, the service is destroyed.

Claim	Public Documentation
	; https://developer.android.com/guide/components/activities/activity-lifecycle:

Activity-lifecycle concepts

To navigate transitions between stages of the activity lifecycle, the `Activity` class provides a core set of six callbacks: `onCreate()`, `onStart()`, `onResume()`, `onPause()`, `onStop()`, and `onDestroy()`. The system invokes each of these callbacks as the activity enters a new state.

Figure 1 presents a visual representation of this paradigm.

As the user begins to leave the activity, the system calls methods to dismantle the activity. In some cases, the activity is only partially dismantled and still resides in memory, such as when the user switches to another app. In these cases, the activity can still come back to the foreground.

If the user returns to the activity, it resumes from where the user left off. With a few exceptions, apps are restricted from starting activities when running in the background.

The system's likelihood of killing a given process, along with the activities in it, depends on the state of the activity at the time. For more information on the relationship between state and vulnerability to ejection, see the section about activity state and ejection from memory.

Depending on the complexity of your activity, you probably don't need to implement all the lifecycle methods. However, it's important that you understand each one and implement those that make your app behave the way users expect.

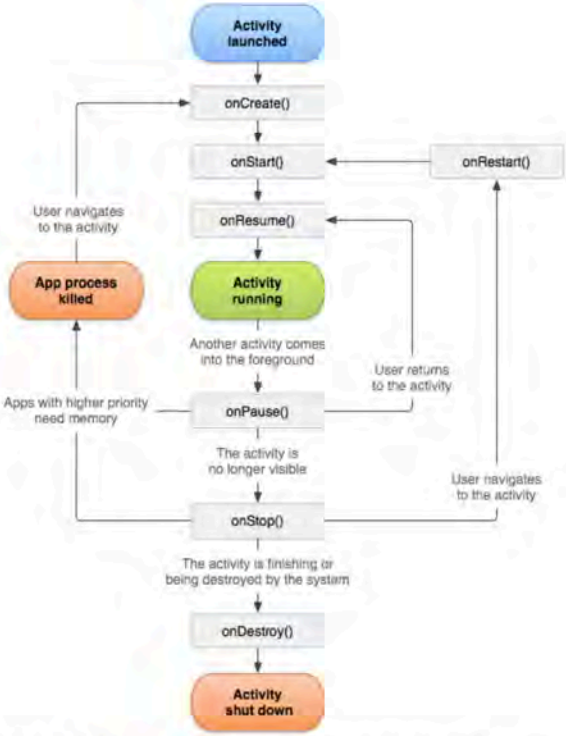
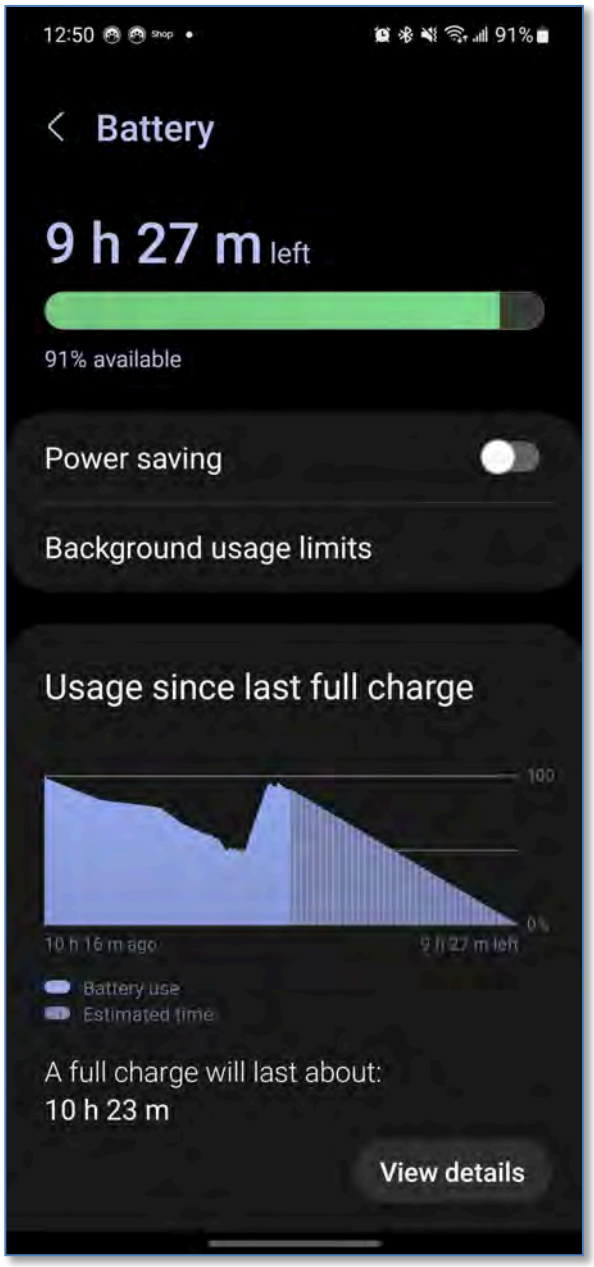
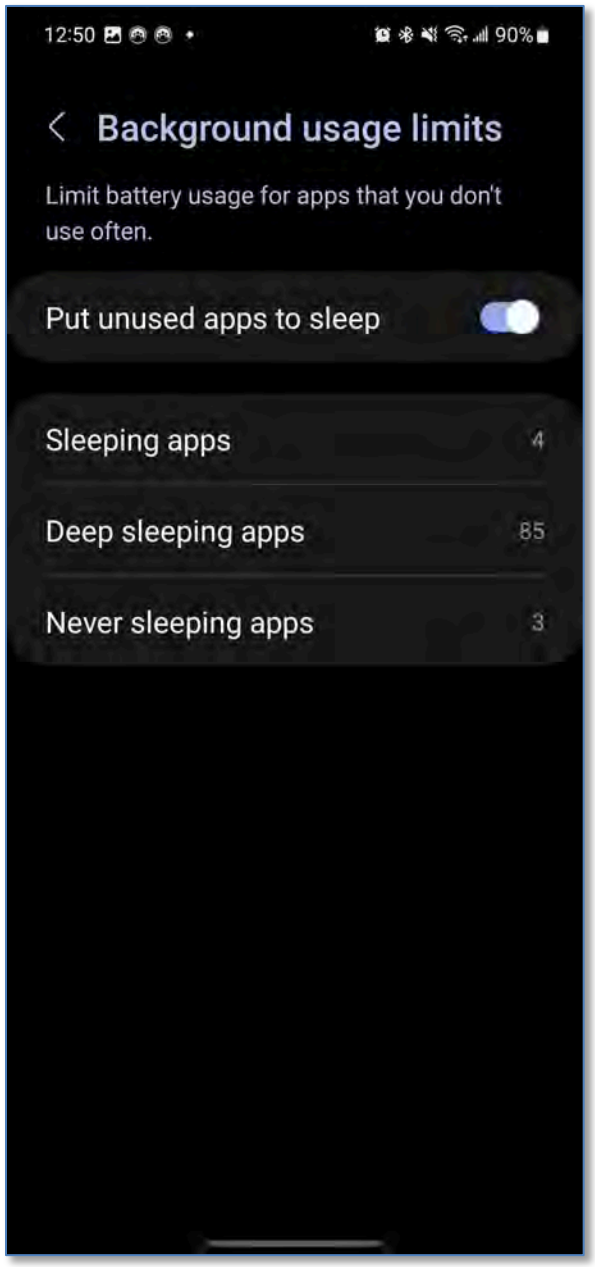
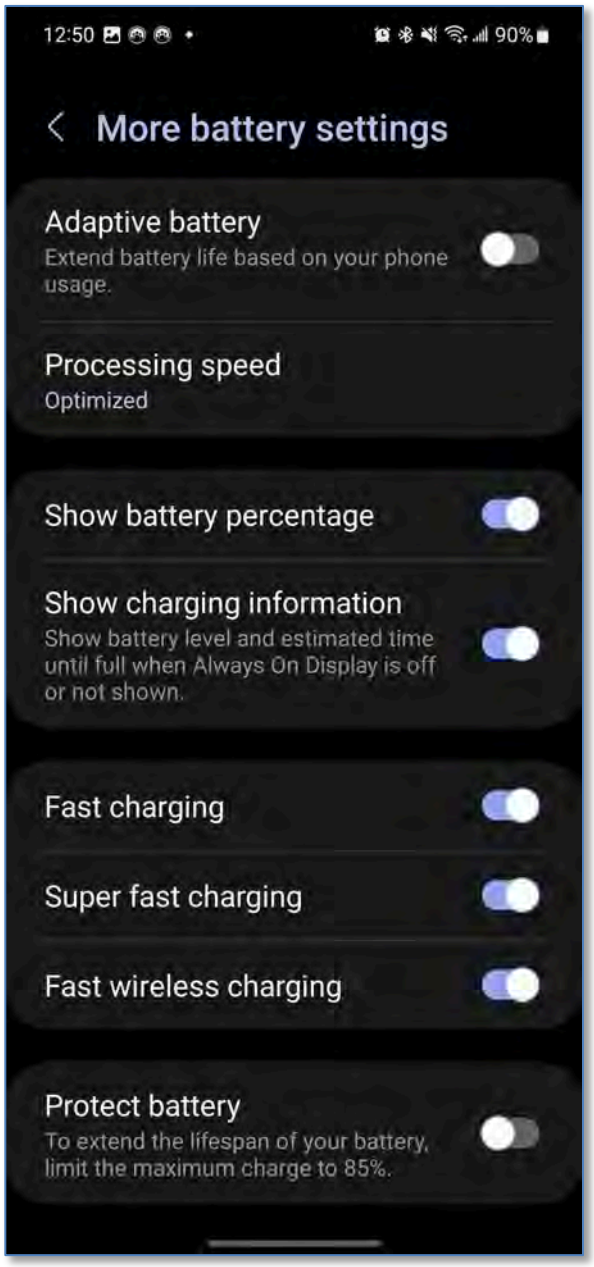


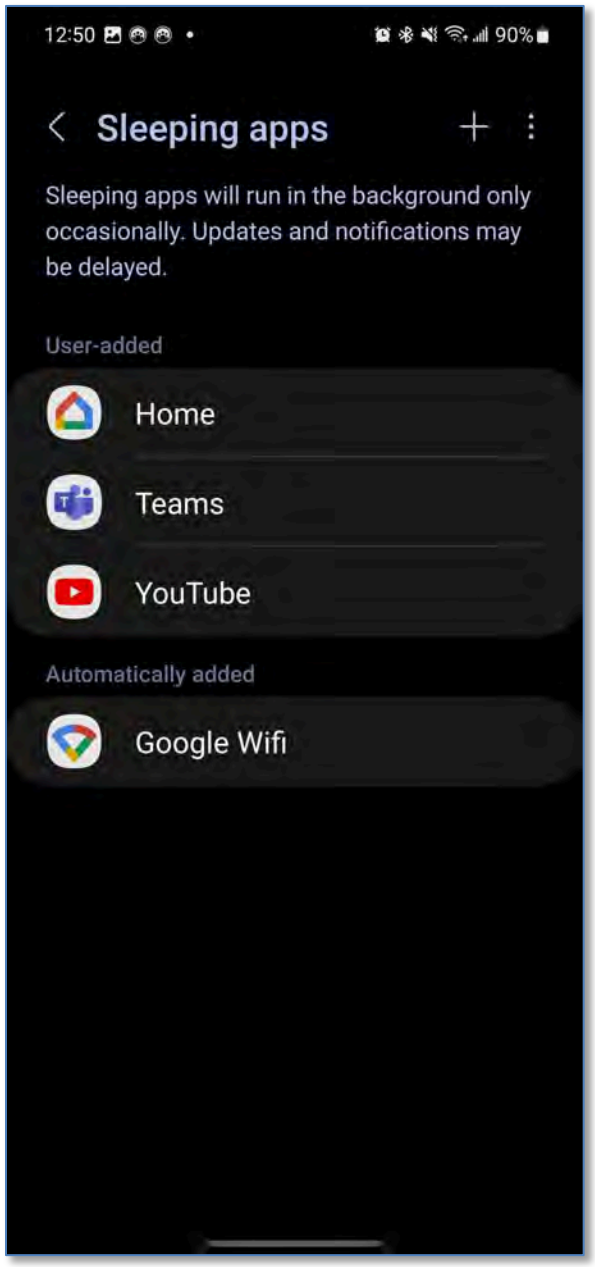
Figure 1. A simplified illustration of the activity lifecycle.

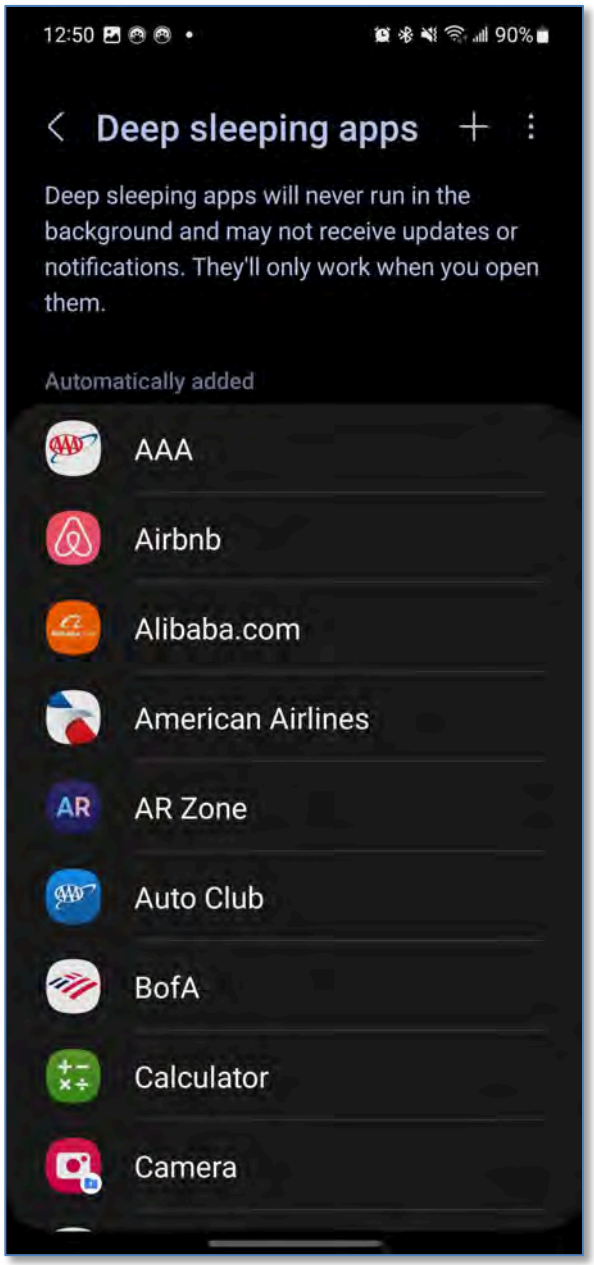
; https://developer.android.com/guide/components/activities/intro-activities; *see also* the exemplary screen-shots below:

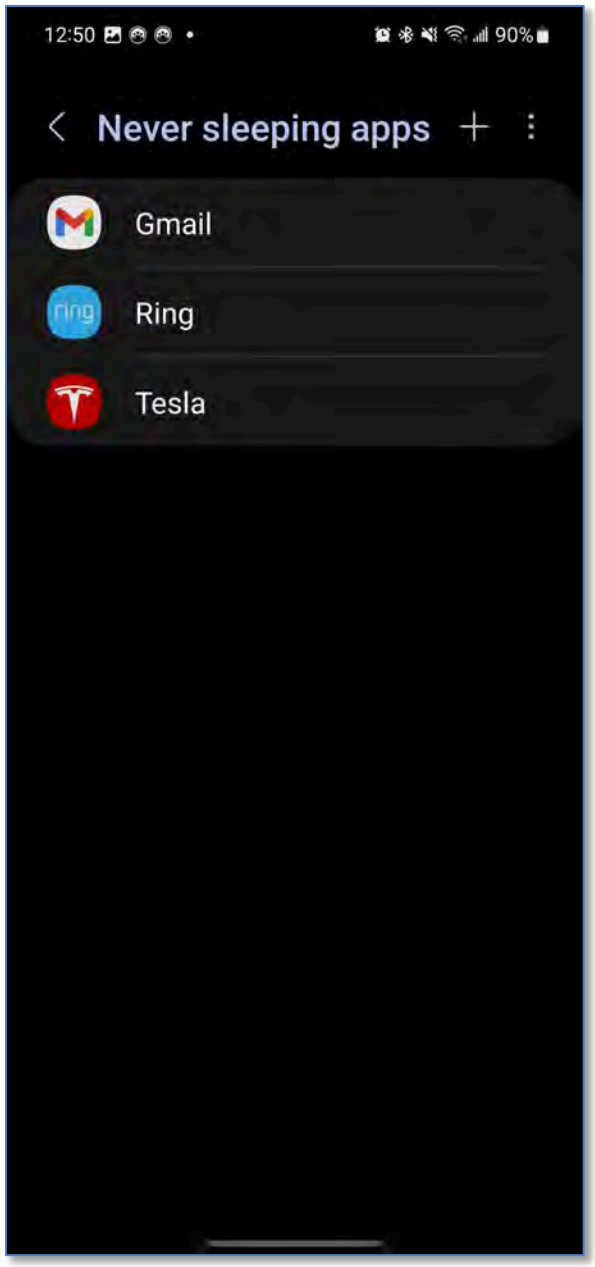

12:50
91%
Battery
9 h 27 m left
91% available
Power saving
Background usage limits
Usage since last full charge
100
0%
10 h 16 m ago
9 h 27 m left
Battery use
Estimated time
A full charge will last about:
10 h 23 m
View details

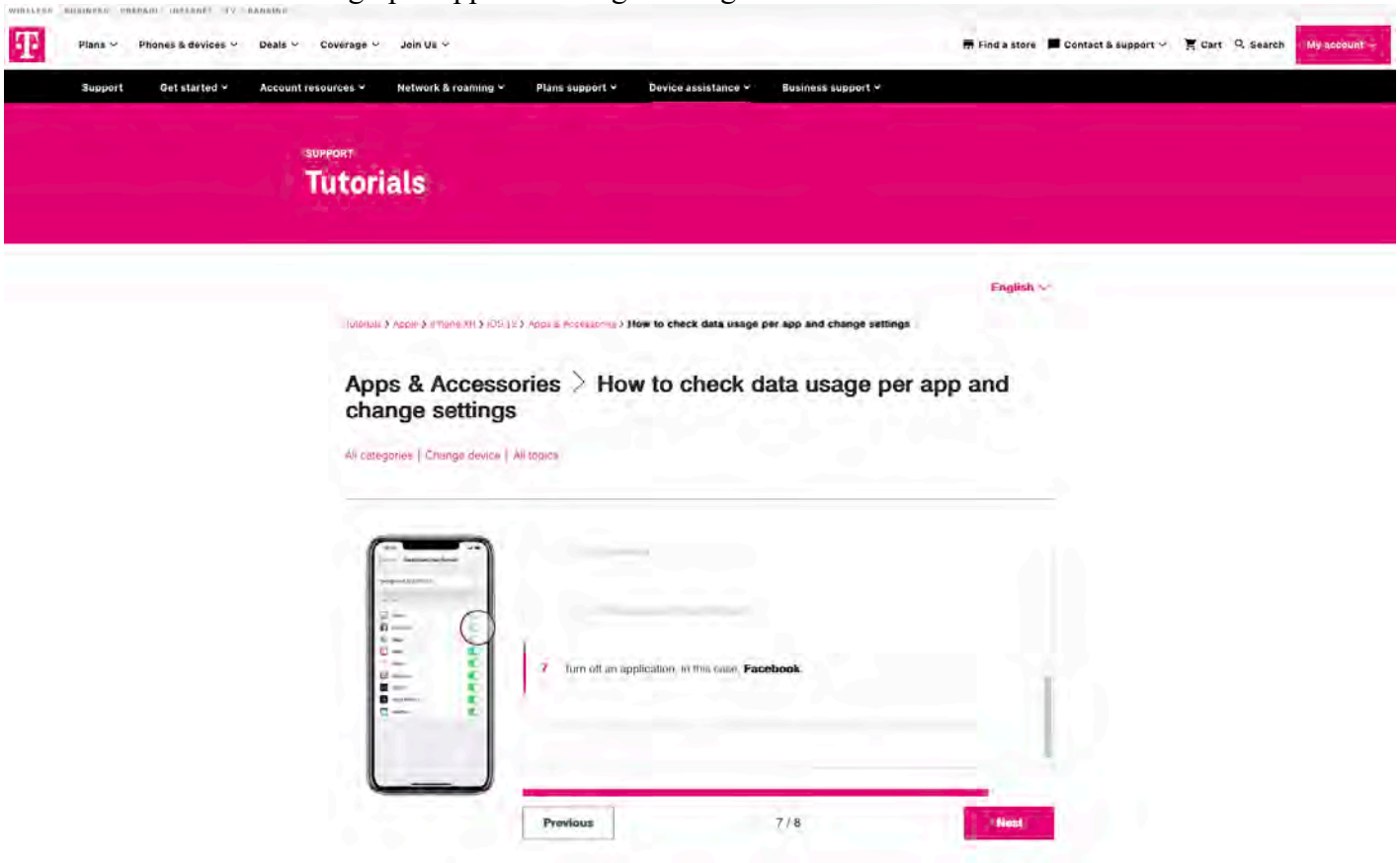

12:50
90%
Background usage limits
Limit battery usage for apps that you don't use often.
Put unused apps to sleep
Sleeping apps 4
Deep sleeping apps 85
Never sleeping apps 3


12:50
90%
More battery settings
Adaptive battery
Extend battery life based on your phone usage.
Processing speed
Optimized
Show battery percentage
Show charging information
Show battery level and estimated time until full when Always On Display is off or not shown.
Fast charging
Super fast charging
Fast wireless charging
Protect battery
To extend the lifespan of your battery, limit the maximum charge to 85%.


12:50
90%
Sleeping apps
Sleeping apps will run in the background only occasionally. Updates and notifications may be delayed.
User-added
Home
Teams
YouTube
Automatically added
Google Wifi


12:50
90%
Deep sleeping apps
Deep sleeping apps will never run in the background and may not receive updates or notifications. They'll only work when you open them.
Automatically added
AAA
Airbnb
Alibaba.com
American Airlines
AR Zone
Auto Club
BofA
Calculator
Camera


12:50
90%
Never sleeping apps
Gmail
Ring
Tesla

Claim	Public Documentation
	See also e.g., https://www.t-mobile.com/support/tutorials/device/apple/iphone-xr/topic/apps-amp-accessories/how-to-check-data-usage-per-app-and-change-settings/7  ; https://support.apple.com/en-us/HT202070:

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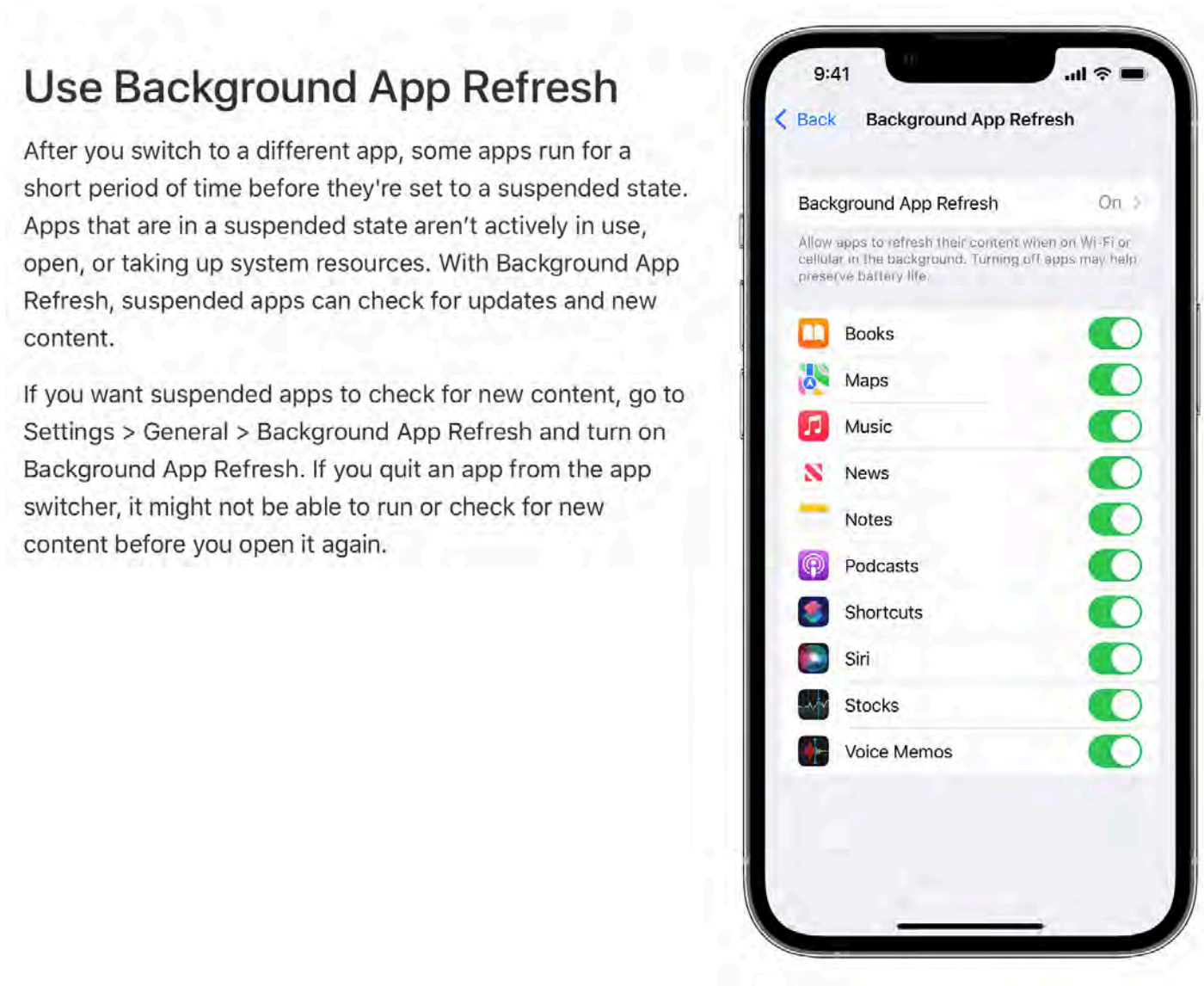
	 https://support.apple.com/en-us/HT205234:

Use Low Power Mode to save battery life on your iPhone or iPad

Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

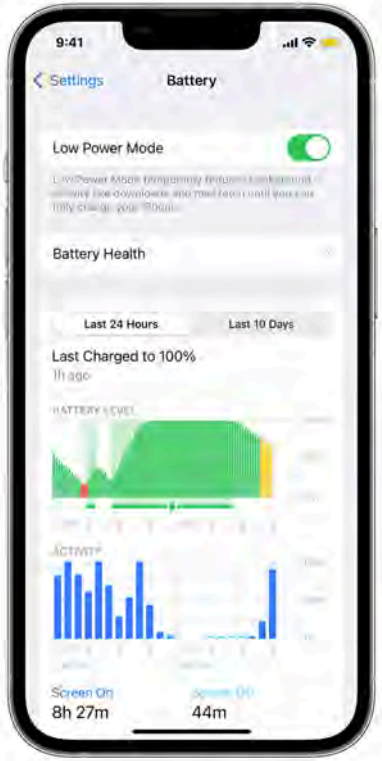
To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.

Low Power Mode reduces or affects these features:

- 5G (except for video streaming) on iPhone 12 and iPhone 13 models[1]
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display[2]
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.



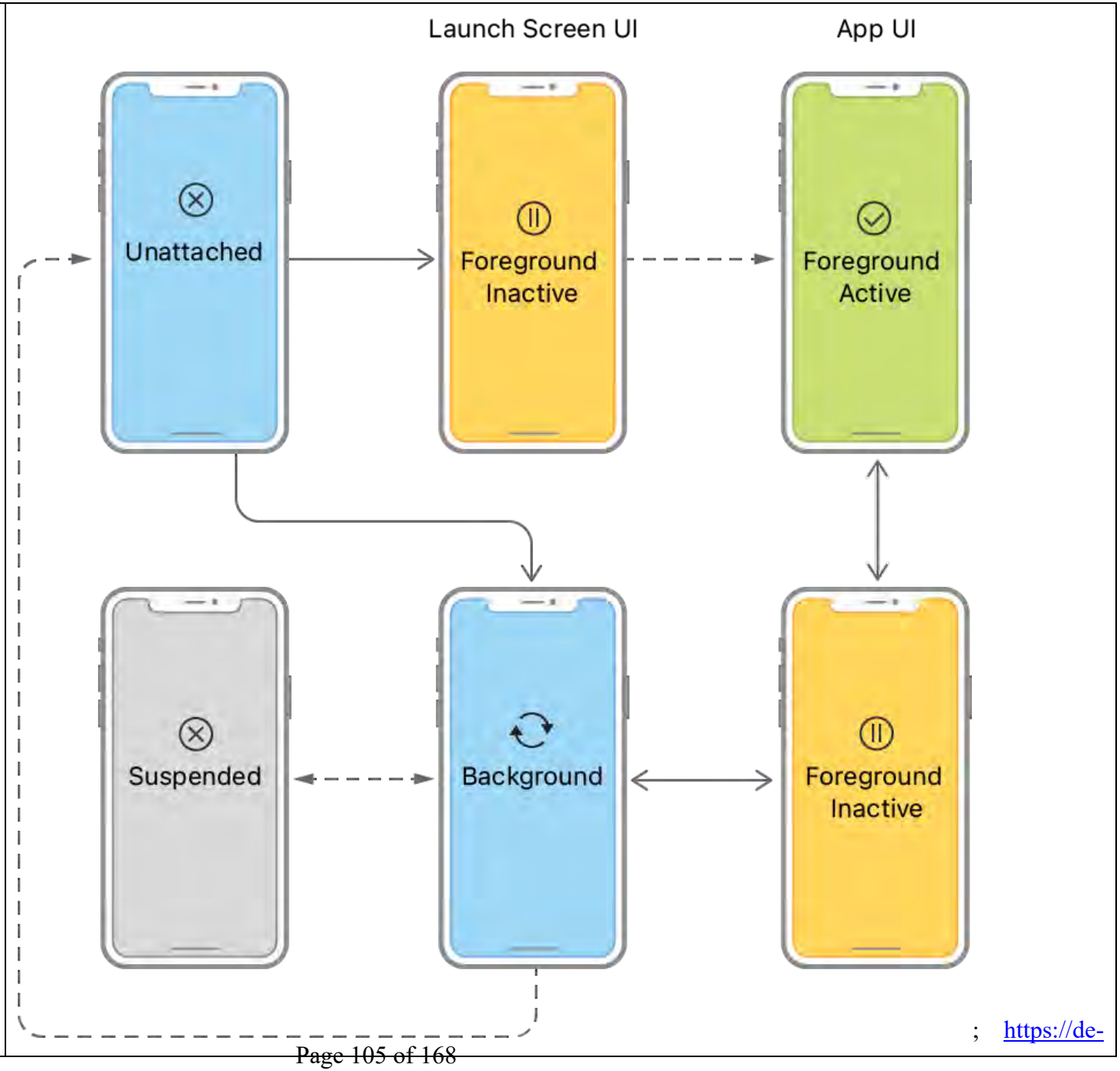
1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

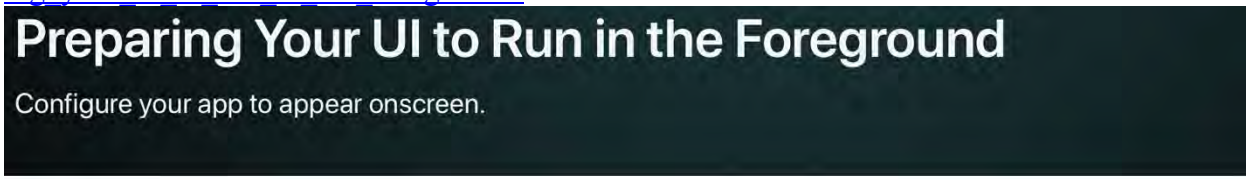
Claim	Public Documentation
	https://www.apple.com/batteries/maximizing-performance/: **View Battery Usage information** With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery. Here are the messages you may see listed below the apps you've been using: **Background Activity.** This indicates that the battery was used by the app while it was in the background — that is, while you were using another app. • To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely. • If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data. ; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate:

Claim	Public Documentation
	Instance Property **applicationState** The app's current state, or that of its most active scene. iOS 4.0+ iPadOS 4.0+ Mac Catalyst 13.1+ tvOS 9.0+ visionOS 1.0+ Beta `var applicationState: UIApplication.State { get }` **Discussion** The behavior of this property depends on whether your app is scene-based. In a scene-based app, this property takes the value of the most active scene, which it determines from each scene's `activationState` property. A scene-based app launches in the background state, and transitions between its states as scenes connect, change their states, and disconnect. For scene-based apps, use `UISceneDelegate` to respond to changes in an individual scene's life cycle. In a sceneless app, the property's value is always the app's current state. The app is inactive at launch, and then is generally in either an active or background state. The app may become inactive for a short period — for example, when transitioning between active and background states, when the system presents an alert in front of it, or when the system displays the application switcher. For sceneless apps, use `UIApplicationDelegate` to respond to the app's life cycle changes. ; https://developer.apple.com/documentation/uikit/app_and_environment/managing_your_app_s_life_cycle:

Claim	Public Documentation
	 ## Overview The current state of your app determines what it can and cannot do at any time. For example, a foreground app has the user's attention, so it has priority over system resources, including the CPU. By contrast, a background app must do as little work as possible, and preferably nothing, because it is offscreen. As your app changes from state to state, you must adjust its behavior accordingly.


Launch Screen UI
App UI
Unattached
Foreground Inactive
Foreground Active
Suspended
Background
Foreground Inactive

; https://de-

Claim	Public Documentation
	veloper.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_foreground/:  **Overview** Use foreground transitions to prepare your app's UI to appear onscreen. An app's transition to the foreground is usually in response to a user action. For example, when the user taps the app's icon, the system launches the app and brings it to the foreground. Use a foreground transition to update your app's UI, acquire resources, and start the services you need to handle user requests.

Claim	Public Documentation
	Configure Your User Interface and Initial Tasks at Activation The system moves your app to the active state immediately before displaying the app's UI. Activation is a good time to configure your app's UI and runtime behavior; specifically: • Show your app's windows, if needed. • Change the currently visible view controller, if needed. • Update the data values and state of views and controls. • Display controls to resume a paused game. • Start or resume any dispatch queues that you use to execute tasks. • Update data source objects. • Start timers for periodic tasks. Put your configuration code in one of the following methods: • For a scene-based UI—The `sceneDidBecomeActive(_:)` method of the appropriate scene delegate object. • For all other apps—The `applicationDidBecomeActive(_:)` method of your app delegate object. Activation is also the time to put finishing touches on your UI before displaying it to the user. Don't run any code that might block your activation method. Instead, make sure you have everything you need in advance. For example, if your data changes frequently outside of the app, use background tasks to fetch updates from the network before your app returns to the foreground. Otherwise, be prepared to display existing data while you fetch changes asynchronously. https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/; https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/prepar-

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	ing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks https://developer.apple.com/documentation/backgroundtasks/bgapprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocessingtask; https://developer.apple.com/documentation/backgroundtasks/bgtask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_foreground/; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate; https://developer.apple.com/documentation/uikit/uiapplication/state; https://developer.apple.com/documentation/foundation/url_loading_system; https://developer.apple.com/documentation/foundation/urlsession; https://developer.apple.com/documentation/avfoundation/avplayer; https://developer.apple.com/documentation/avfoundation/media_playback/configuring_your_app_for_media_playback; https://developer.apple.com/videos/play/wwdc2019/707/; https://developer.apple.com/videos/play/wwdc2020/10063:

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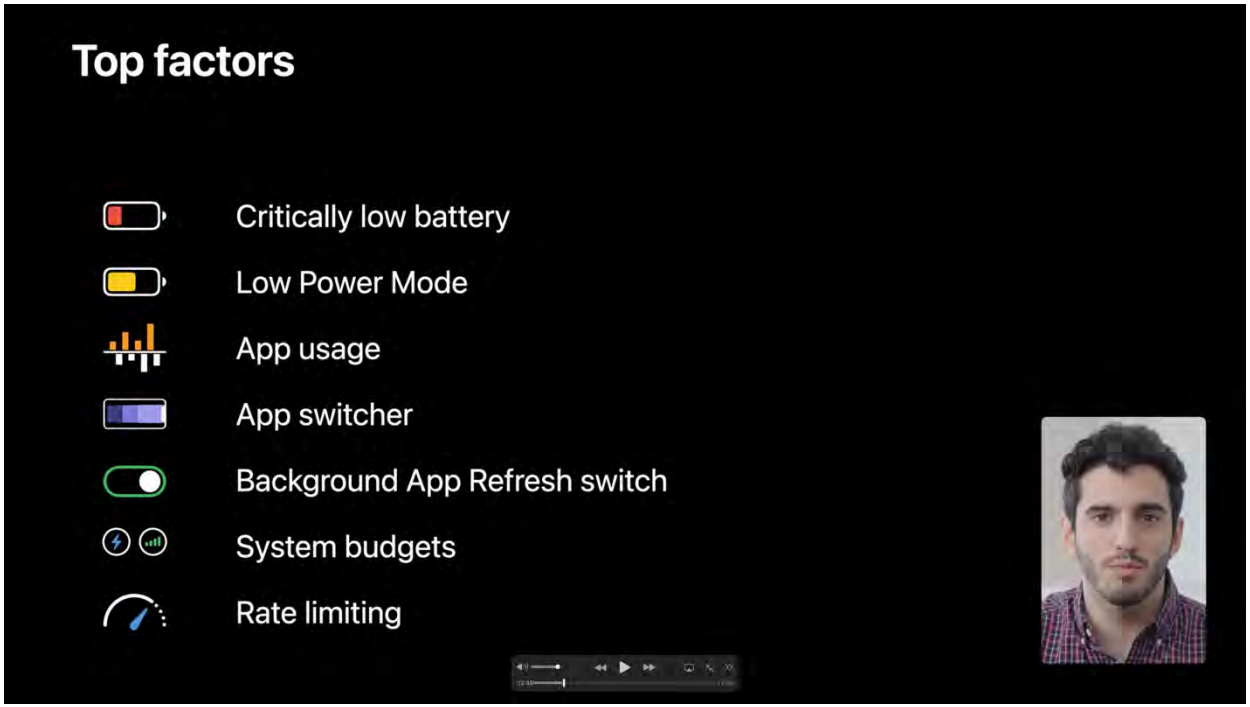
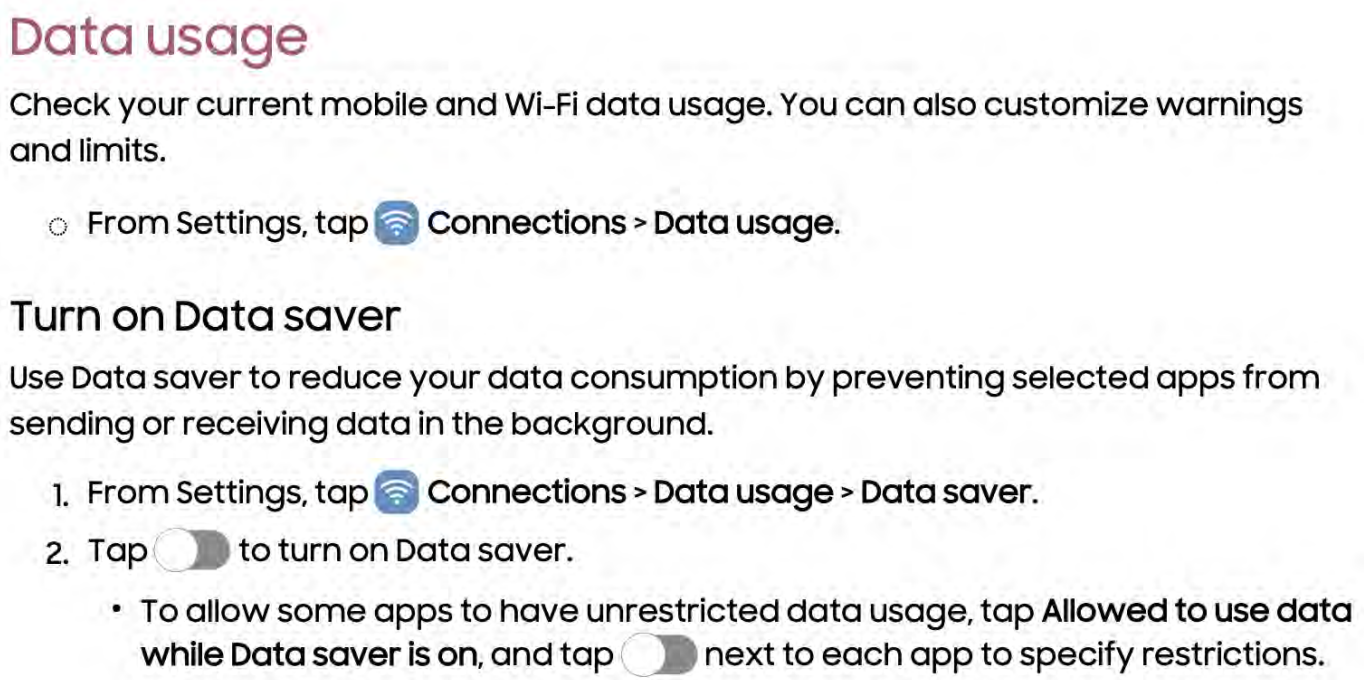

Top factors
Critically low battery
Low Power Mode
App usage
App switcher
Background App Refresh switch
System budgets
Rate limiting

Claim	Public Documentation
[1j] is interacting with the user in the device user interface foreground, and	The Accused Instrumentalities comprise one or more applications "interacting with the user in the device user interface foreground." For example, phones and tablets sold and used by T-Mobile classify applications and internet service activities in both foreground and background. *See, e.g.*, https://www.t-mobile.com/support/public-files/attachments/samsung/samsung-galaxy-s21-fe-5g/Samsung%20Galaxy%20S21%20FE%205G_English%20User%20Guide_FINAL2.pdf:

Claim	Public Documentation
	 ; https://www.samsung.com/us/support/answer/ANS00079018/:

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	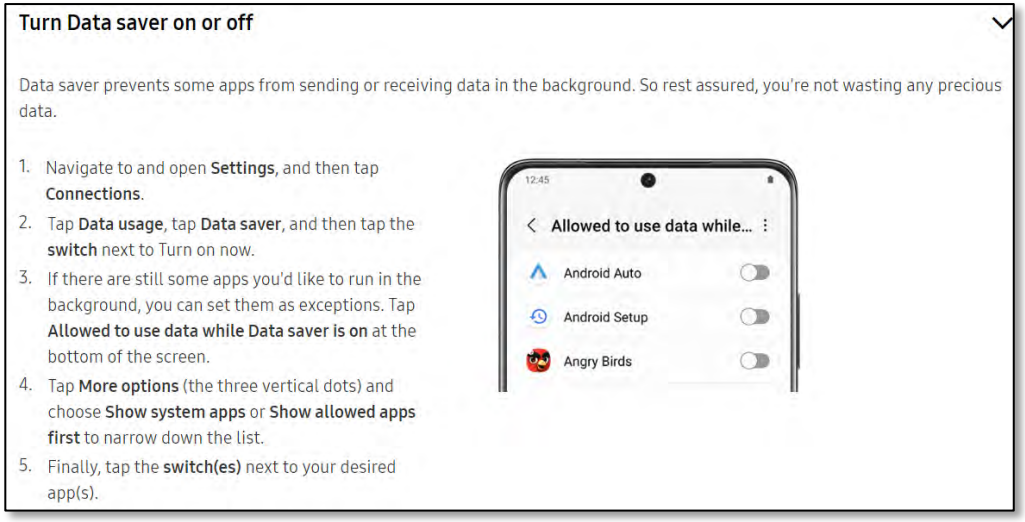 ; https://www.samsung.com/ae/support/mobile-devices/android-pie-what-is-the-data-saver-feature/:

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	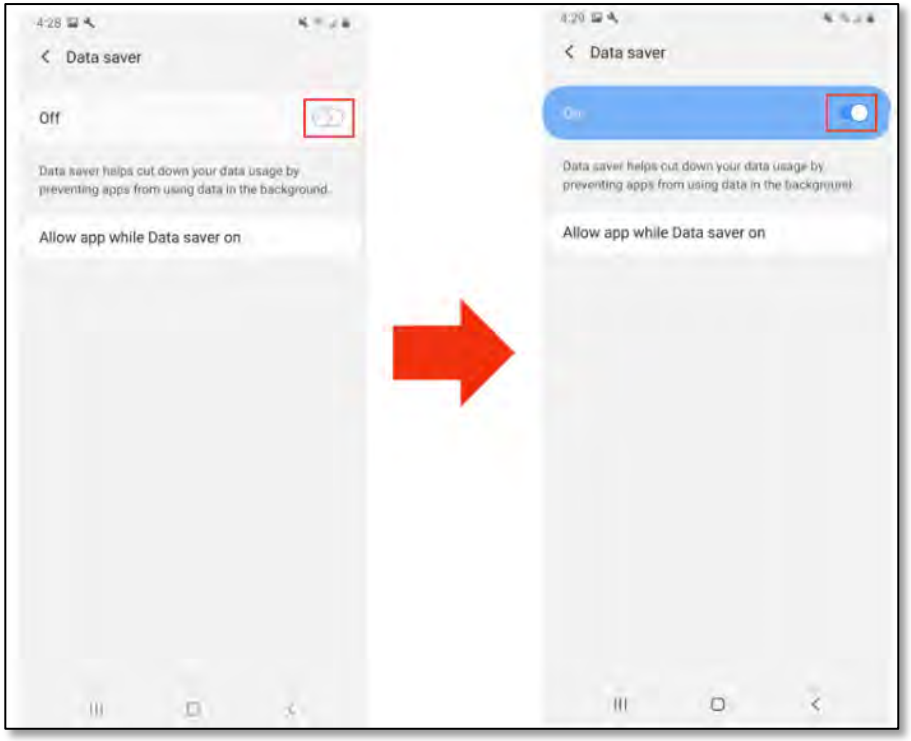

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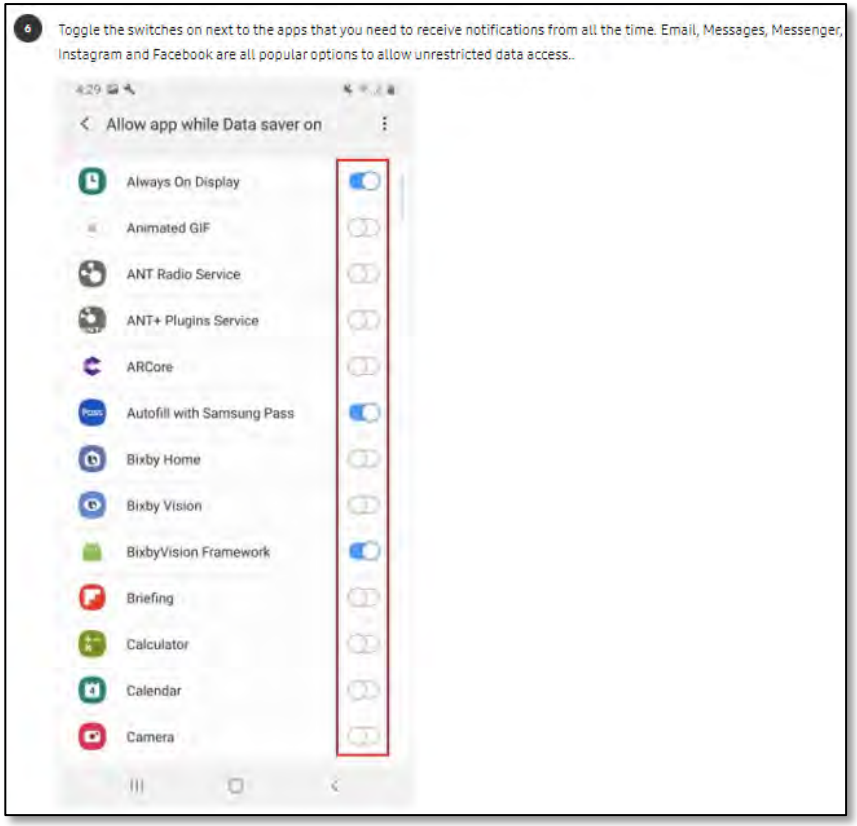
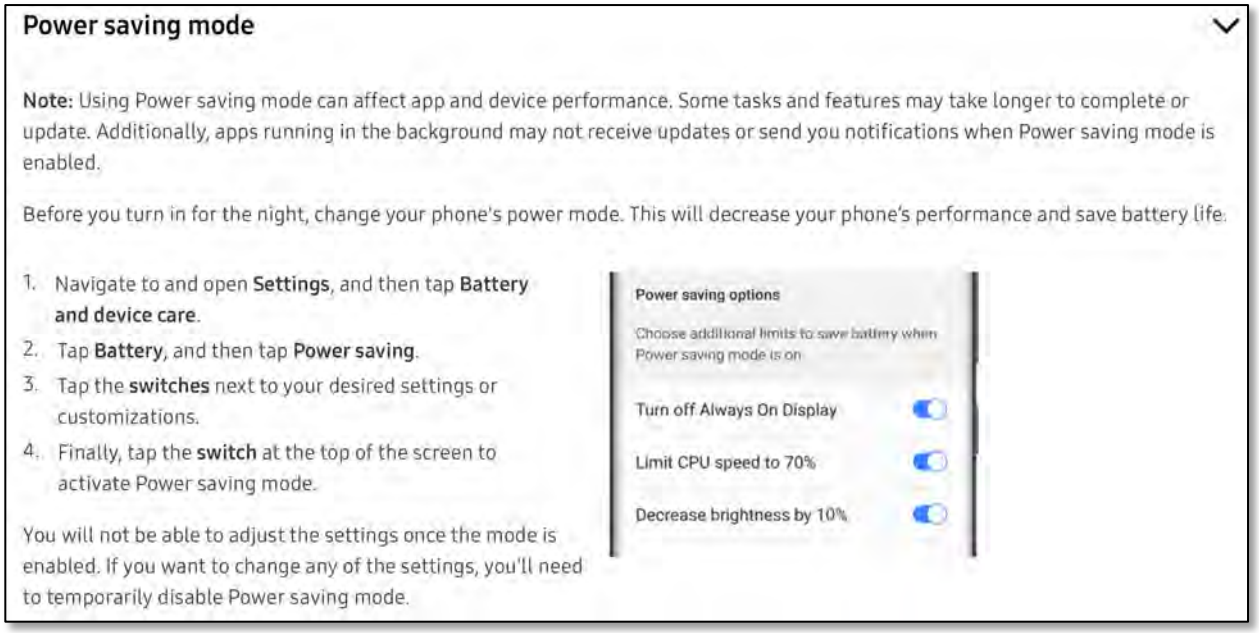
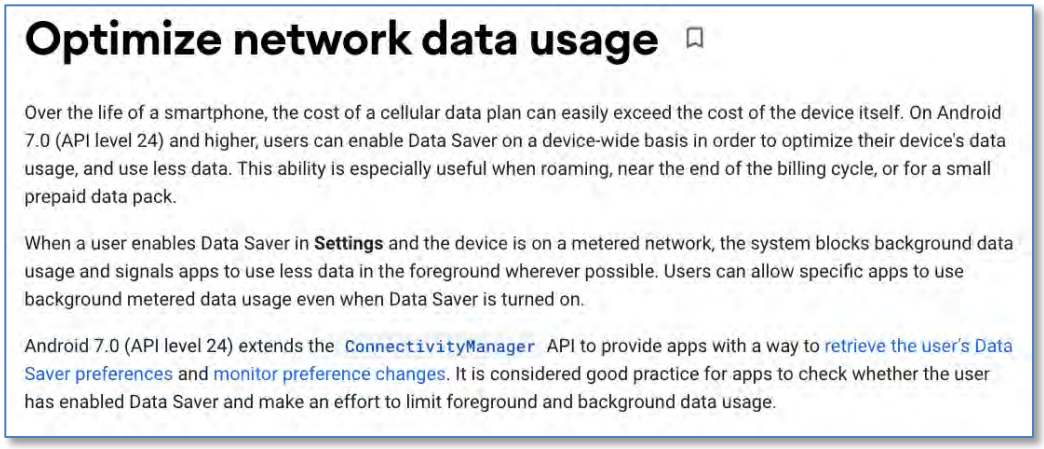
	 ; https://www.samsung.com/us/support/answer/ANS00078987/:

Claim	Public Documentation
	 ; https://developer.android.com/training/basics/network-ops/data-saver: 

Claim	Public Documentation

	Check data saver preferences
	On Android 7.0 (API level 24) and higher, apps can use the `ConnectivityManager` API to determine what data usage restrictions are being applied. The `getRestrictBackgroundStatus()` method returns one of the following values:
	`RESTRICT_BACKGROUND_STATUS_DISABLED`
	Data Saver is disabled.
	`RESTRICT_BACKGROUND_STATUS_ENABLED`
	The user has enabled Data Saver for this app. Apps should make an effort to limit data usage in the foreground and gracefully handle restrictions to background data usage.
	`RESTRICT_BACKGROUND_STATUS_WHITELISTED`
	The user has enabled Data Saver but the app is allowed to bypass it. Apps should still make an effort to limit foreground and background data usage.
	Limit data usage whenever the device is connected to a metered network, even if Data Saver is disabled or the app is allowed to bypass it. The following sample code uses `ConnectivityManager.isActiveNetworkMetered()` and `ConnectivityManager.getRestrictBackgroundStatus()` to determine how much data the app should use:
	; https://developer.android.com/training/monitoring-device-state/doze-standby:
	Optimize for Doze and App Standby
	Starting from Android 6.0 (API level 23), Android introduces two power-saving features that extend battery life for users by managing how apps behave when a device is not connected to a power source. *Doze* reduces battery consumption by deferring background CPU and network activity for apps when the device is unused for long periods of time. *App Standby* defers background network activity for apps with which the user has not recently interacted.
	While the device is in Doze, apps' access to certain battery-intensive resources is deferred until maintenance windows. The specific restrictions are listed in Power Management Restrictions.
	Doze and App Standby manage the behavior of all apps running on Android 6.0 or higher, regardless whether they are specifically targeting API level 23. To ensure the best experience for users, test your app in Doze and App Standby modes and make any necessary adjustments to your code. The sections below provide details.

Claim	Public Documentation

Understanding Doze

If a user leaves a device unplugged and stationary for a period of time, with the screen off, the device enters Doze mode. In Doze mode, the system attempts to conserve battery by restricting apps' access to network and CPU-intensive services. It also prevents apps from accessing the network and defers their jobs, syncs, and standard alarms.

Periodically, the system exits Doze for a brief time to let apps complete their deferred activities. During this *maintenance window*, the system runs all pending syncs, jobs, and alarms, and lets apps access the network.

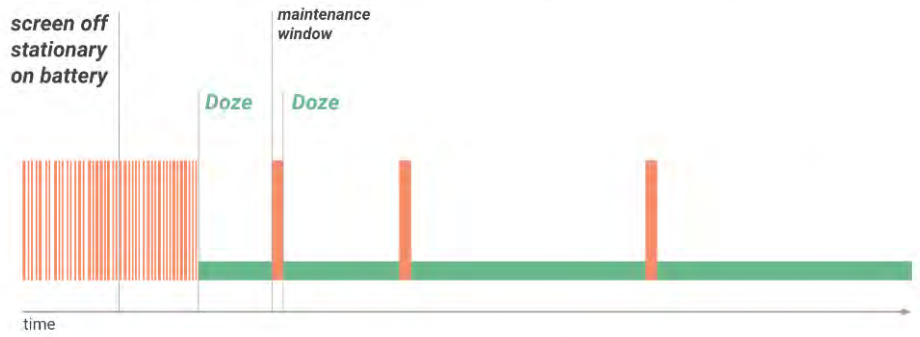


Figure 1. Doze provides a recurring maintenance window for apps to use the network and handle pending activities.

At the conclusion of each maintenance window, the system again enters Doze, suspending network access and deferring jobs, syncs, and alarms. Over time, the system schedules maintenance windows less and less frequently, helping to reduce battery consumption in cases of longer-term inactivity when the device is not connected to a charger.

As soon as the user wakes the device by moving it, turning on the screen, or connecting a charger, the system exits Doze and all apps return to normal activity.

The Doze restriction on network access is also likely to affect your app, especially if the app relies on real-time messages such as tickles or notifications. If your app requires a persistent connection to the network to receive messages, you should use Firebase Cloud Messaging (FCM) if possible.

; https://developer.android.com/topic/performance/appstandby:

App Standby Buckets

Android 9 (API level 28) and higher support **App Standby Buckets**. App Standby Buckets help the system prioritize apps' requests for resources based on how recently and how frequently the apps are used. Based on app usage patterns, each app is placed in one of five priority **buckets**. The system limits the device resources available to each app based on which bucket the app is in.

Priority buckets

The system dynamically assigns each app to a priority bucket, reassigning the apps as needed. The system may rely on a preloaded app that uses machine learning to determine how likely each app is to be used, and assigns apps to the appropriate buckets. If the system app is not present on a device, the system defaults to sorting apps based on how recently they were used. More active apps are assigned to buckets that give the apps higher priority, making more system resources available to the app. In particular, the bucket determines how frequently the app's jobs run, and how often the app can trigger alarms. These restrictions apply only while the device is on battery power; the system does not impose these restrictions on apps while the device is charging.

Note: Every manufacturer can set their own criteria for how non-active apps are assigned to buckets. You should not try to influence which bucket your app is assigned to. Instead, focus on making sure your app behaves well in whatever bucket it might be in. Your app can find out what bucket it's currently in by calling `UsageStatsManager.getAppStandbyBucket()`.

The buckets are:

1. Active: App is currently being used or was very recently used.
2. Working set: App is in regular use.
3. Frequent: App is often used, but not every day.
4. Rare: App is not frequently used.
5. Restricted: App consumes a great deal of system resources, or may exhibit undesirable behavior.

In addition, there's a special **never** bucket for apps that have been installed but have never been run. The system imposes severe restrictions on these apps.

Claim	Public Documentation
	; https://developer.android.com/topic/performance/power/power-details; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler; https://developer.android.com/guide/background/persistent; https://developer.android.com/guide/components/activities/process-lifecycle: 1. A **foreground process** is one that is required for what the user is currently doing. Various application components can cause its containing process to be considered foreground in different ways. A process is considered to be in the foreground if any of the following conditions hold: • It is running an `Activity` at the top of the screen that the user is interacting with (its `onResume()` method has been called). • It has a `BroadcastReceiver` that is currently running (its `BroadcastReceiver.onReceive()` method is executing). • It has a `Service` that is currently executing code in one of its callbacks (`Service.onCreate()`, `Service.onStart()`, or `Service.onDestroy()`). There will only ever be a few such processes in the system, and these will only be killed as a last resort if memory is so low that not even these processes can continue to run. Generally, at this point, the device has reached a memory paging state, so this action is required in order to keep the user interface responsive. ; https://developer.android.com/guide/background:

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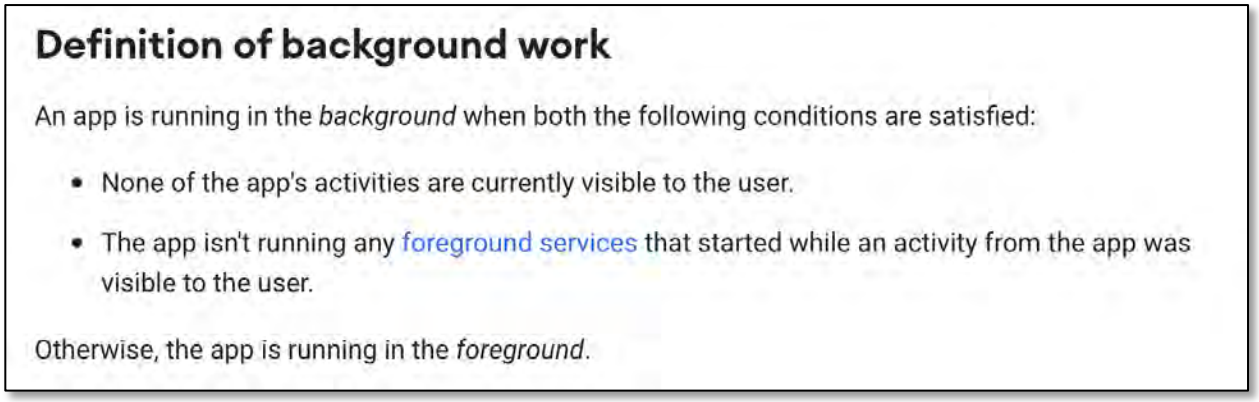
	 ; https://developer.android.com/guide/components/services;

Types of Services

These are the three different types of services:

Foreground

A foreground service performs some operation that is noticeable to the user. For example, an audio app would use a foreground service to play an audio track. Foreground services must display a Notification. Foreground services continue running even when the user isn't interacting with the app.

When you use a foreground service, you must display a notification so that users are actively aware that the service is running. This notification cannot be dismissed unless the service is either stopped or removed from the foreground.

Learn more about how to configure foreground services in your app.

★ **Note:** The WorkManager API offers a flexible way of scheduling tasks, and is able to run these jobs as foreground services if needed. In many cases, using WorkManager is preferable to using foreground services directly.

Background

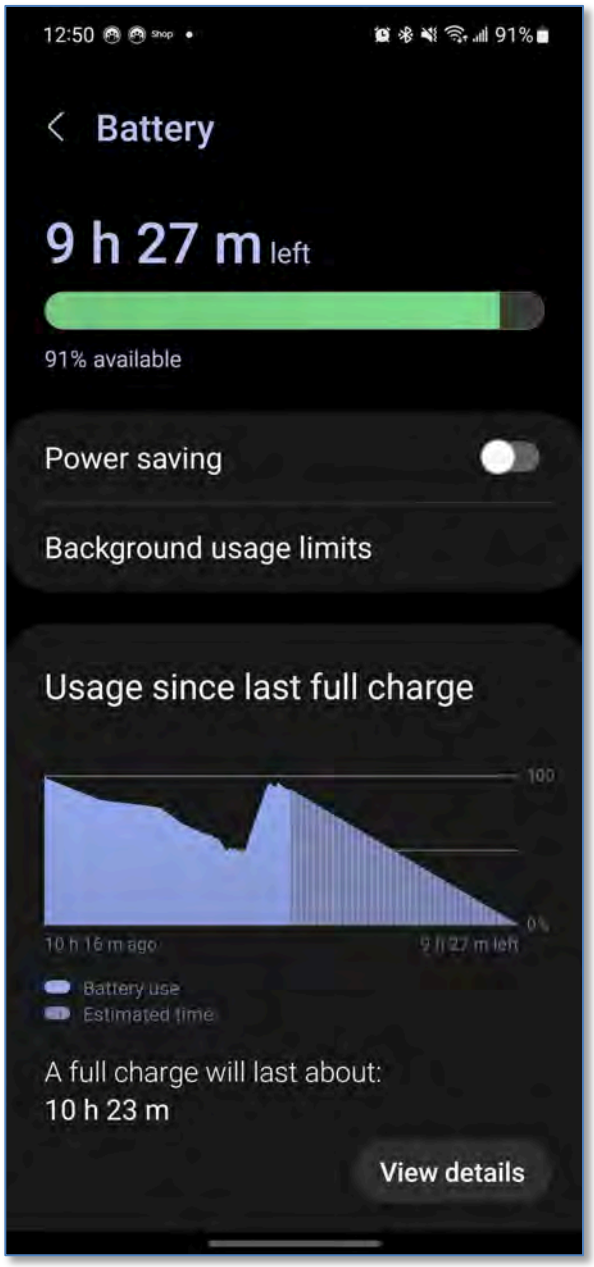
A background service performs an operation that isn't directly noticed by the user. For example, if an app used a service to compact its storage, that would usually be a background service.

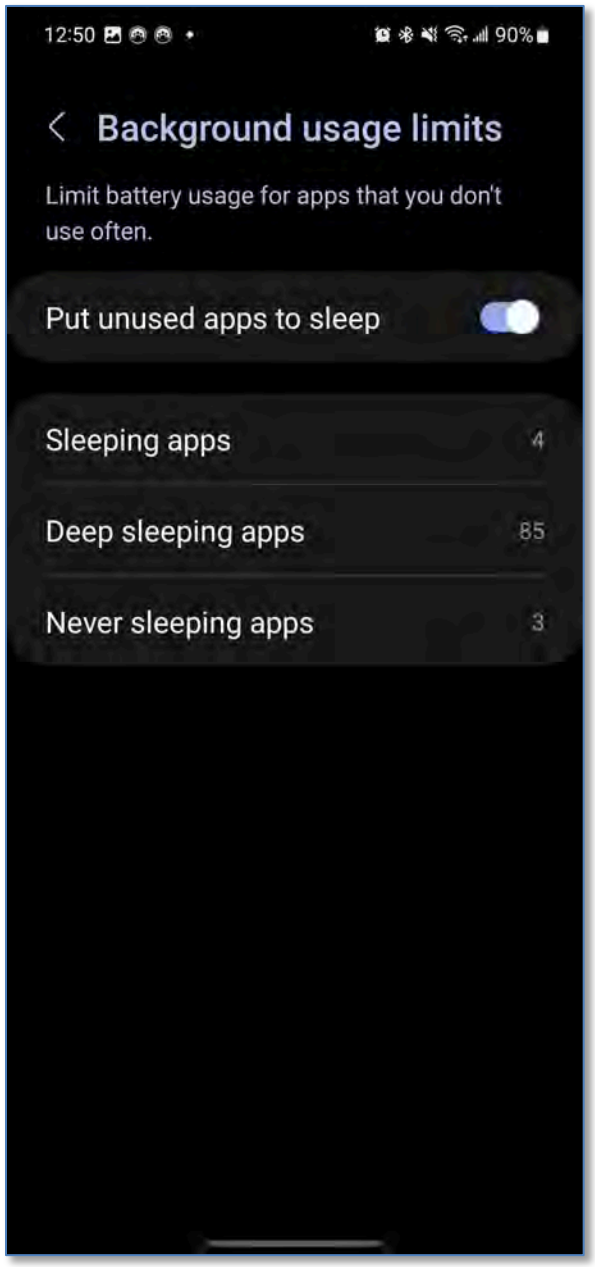
★ **Note:** If your app targets API level 26 or higher, the system imposes restrictions on running background services when the app itself isn't in the foreground. In most situations, for example, you shouldn't access location information from the background. Instead, schedule tasks using WorkManager.

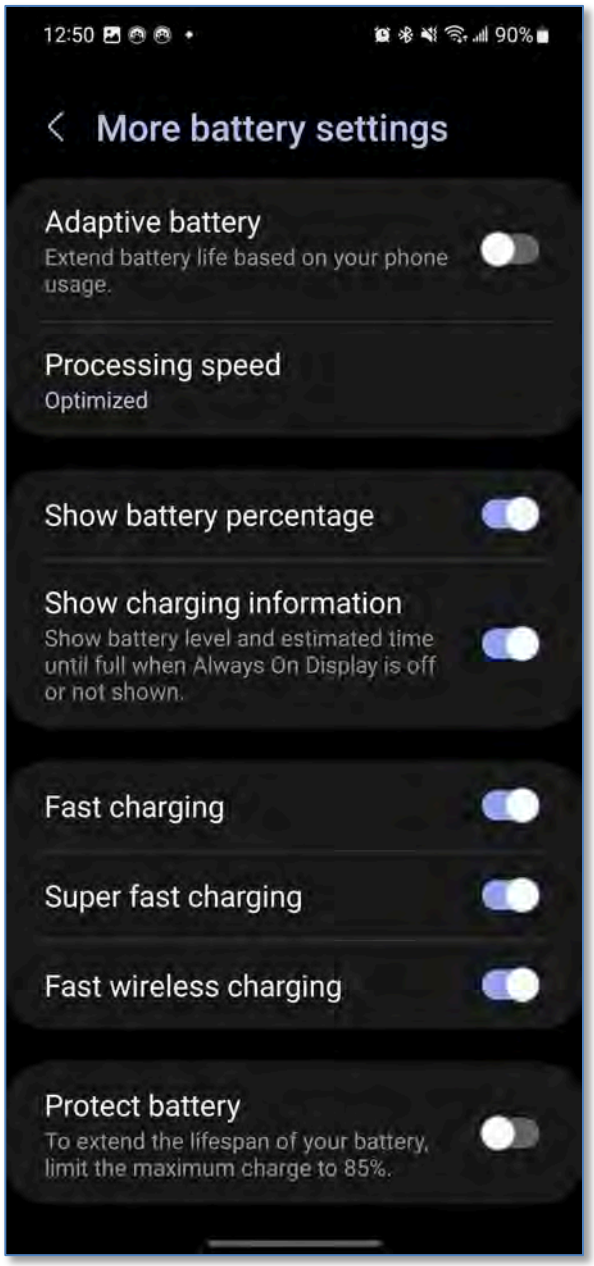
Bound

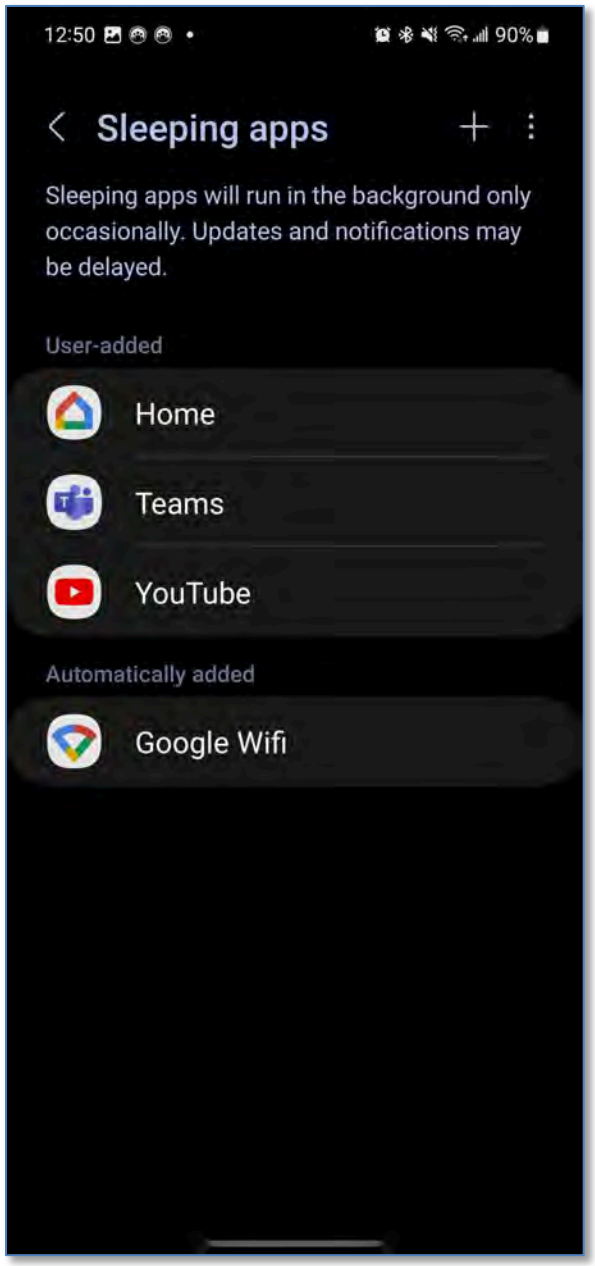
A service is *bound* when an application component binds to it by calling `bindService()`. A bound service offers a client-server interface that allows components to interact with the service, send requests, receive results, and even do so across processes with interprocess communication (IPC). A bound service runs only as long as another application component is bound to it. Multiple components can bind to the service at once, but when all of them unbind, the service is destroyed.

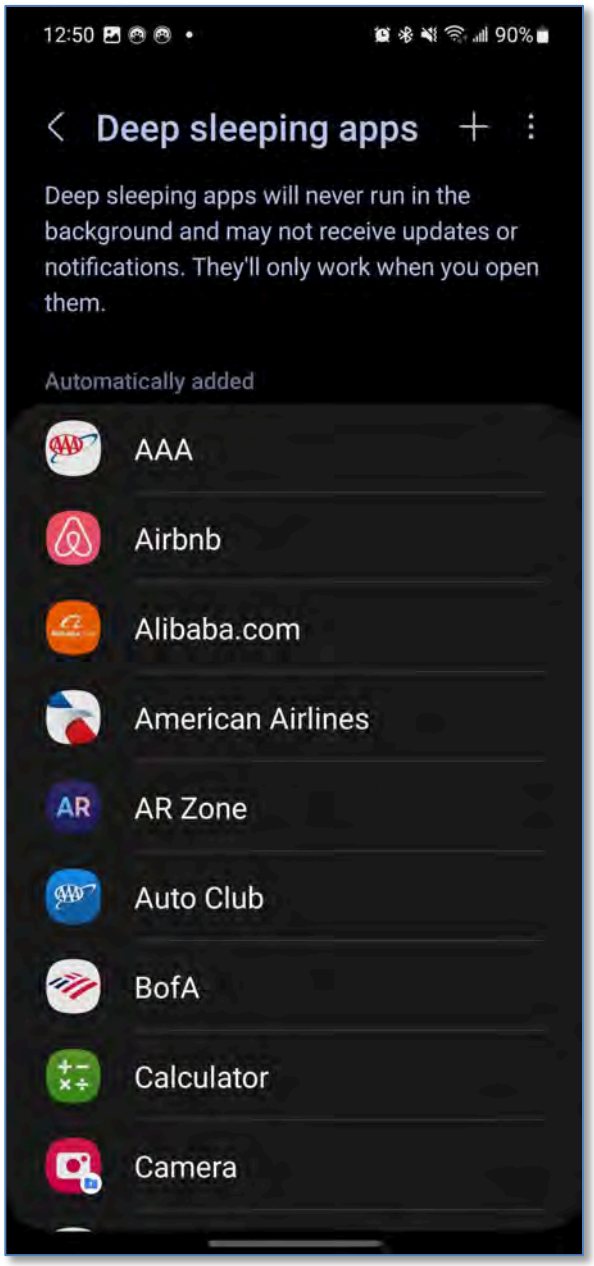
Claim	Public Documentation
	; https://developer.android.com/guide/components/activities/intro-activities; *see also* the exemplary screen-shots below:

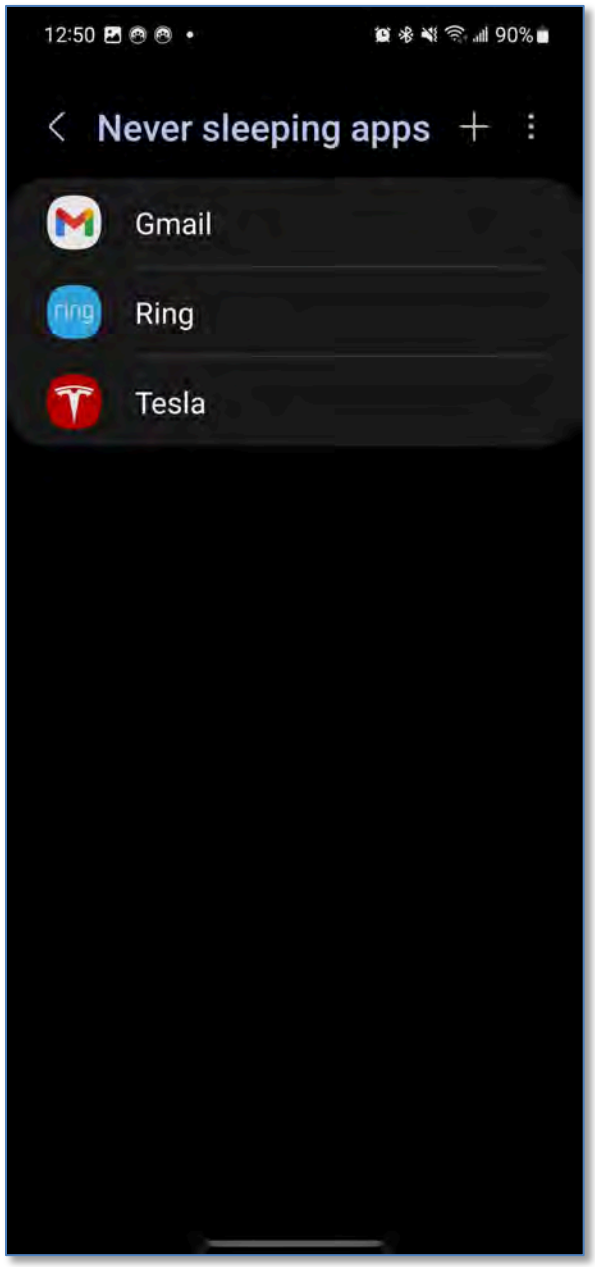

12:50
91%
Battery
9 h 27 m left
91% available
Power saving
Background usage limits
Usage since last full charge
100
0 %
10 h 16 m ago
9 h 27 m left
Battery use
Estimated time
A full charge will last about:
10 h 23 m
View details

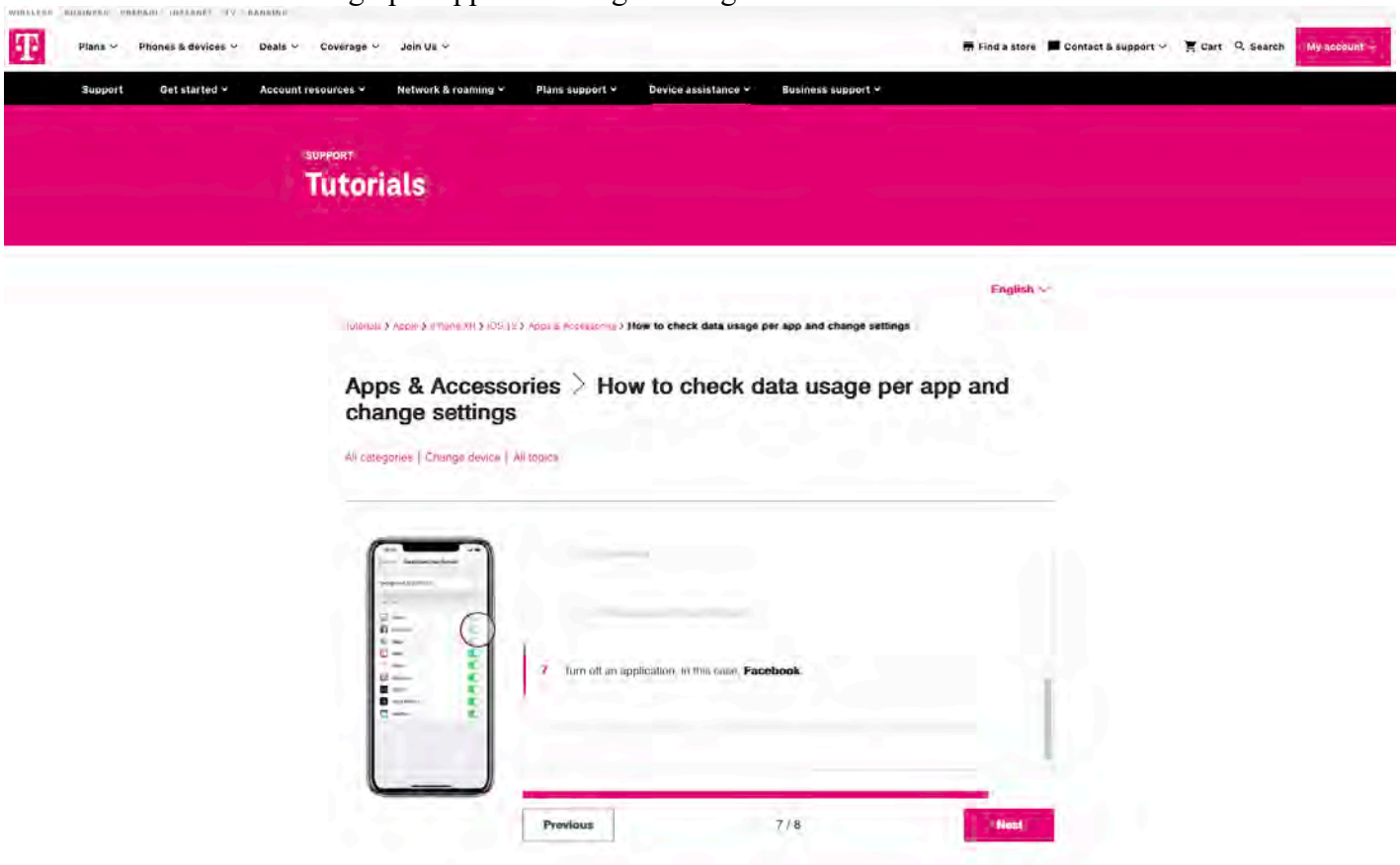

12:50
90%
Background usage limits
Limit battery usage for apps that you don't use often.
Put unused apps to sleep
Sleeping apps 4
Deep sleeping apps 85
Never sleeping apps 3

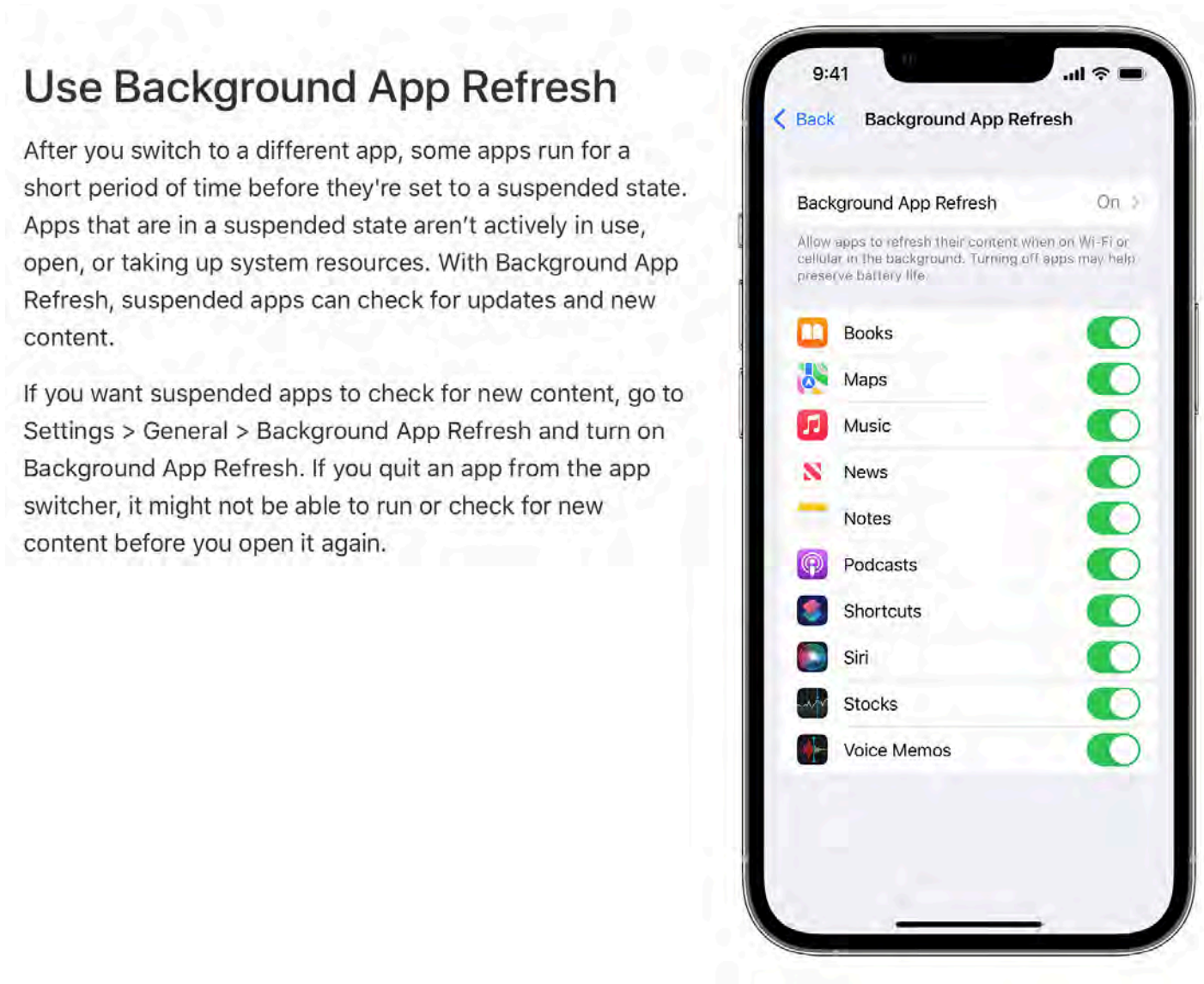

12:50
90%
More battery settings
Adaptive battery
Extend battery life based on your phone usage.
Processing speed
Optimized
Show battery percentage
Show charging information
Show battery level and estimated time until full when Always On Display is off or not shown.
Fast charging
Super fast charging
Fast wireless charging
Protect battery
To extend the lifespan of your battery, limit the maximum charge to 85%.


12:50
90%
Sleeping apps
Sleeping apps will run in the background only occasionally. Updates and notifications may be delayed.
User-added
Home
Teams
YouTube
Automatically added
Google Wifi


12:50
90%
Deep sleeping apps
Deep sleeping apps will never run in the background and may not receive updates or notifications. They'll only work when you open them.
Automatically added
AAA
Airbnb
Alibaba.com
American Airlines
AR Zone
Auto Club
BofA
Calculator
Camera


12:50
90%
Never sleeping apps
Gmail
Ring
Tesla

Claim	Public Documentation
	See also e.g., https://www.t-mobile.com/support/tutorials/device/apple/iphone-xr/topic/apps-amp-accessories/how-to-check-data-usage-per-app-and-change-settings/7  ; https://support.apple.com/en-us/HT202070:

Claim	Public Documentation
	 https://support.apple.com/en-us/HT205234:

Use Low Power Mode to save battery life on your iPhone or iPad

Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

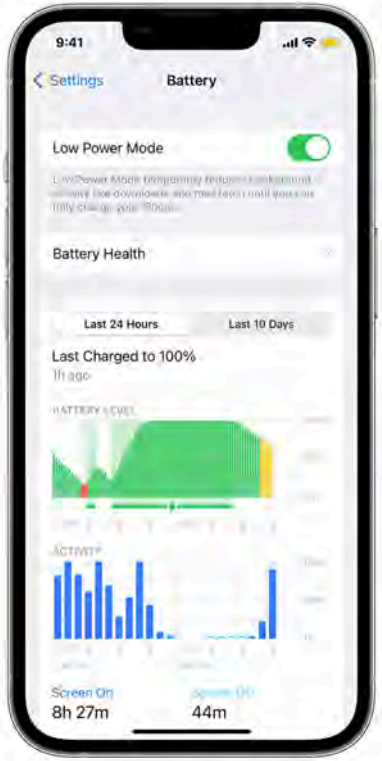
To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.

Low Power Mode reduces or affects these features:

- 5G (except for video streaming) on iPhone 12 and iPhone 13 models[1]
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display[2]
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.



1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

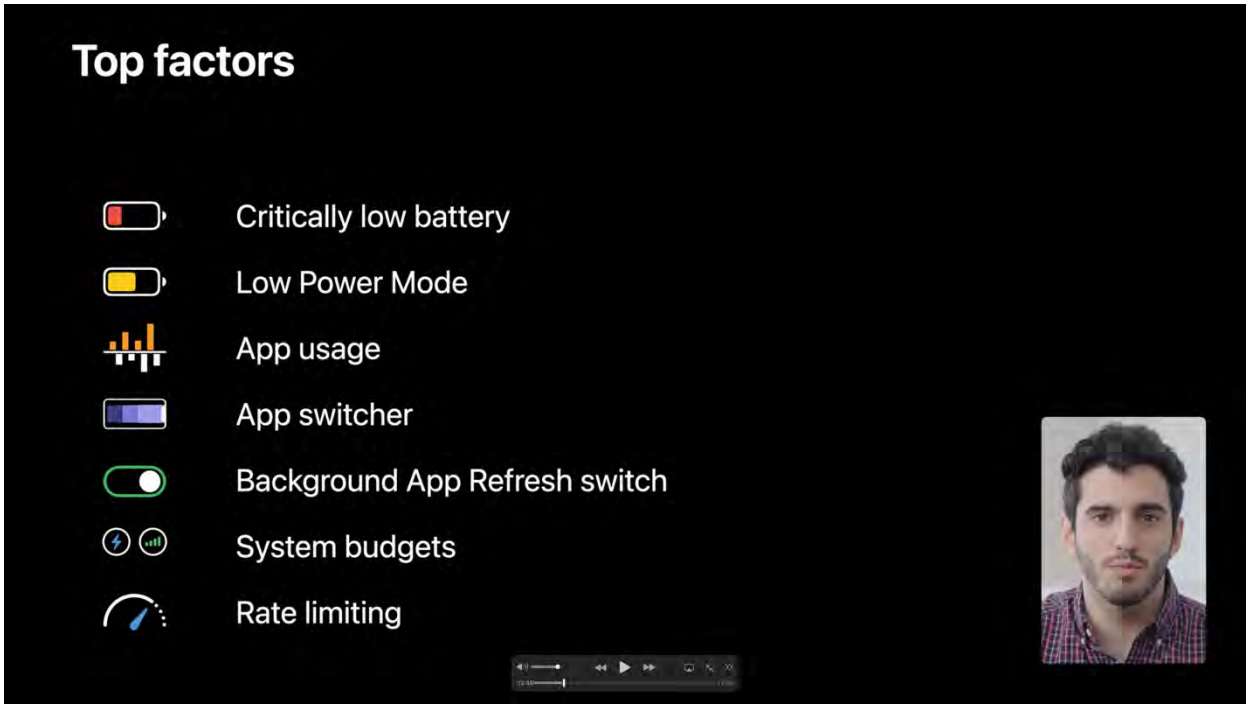
2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

Claim	Public Documentation
	https://www.apple.com/batteries/maximizing-performance/: **View Battery Usage information** With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery. Here are the messages you may see listed below the apps you've been using: **Background Activity.** This indicates that the battery was used by the app while it was in the background — that is, while you were using another app. • To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely. • If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data. ; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate:

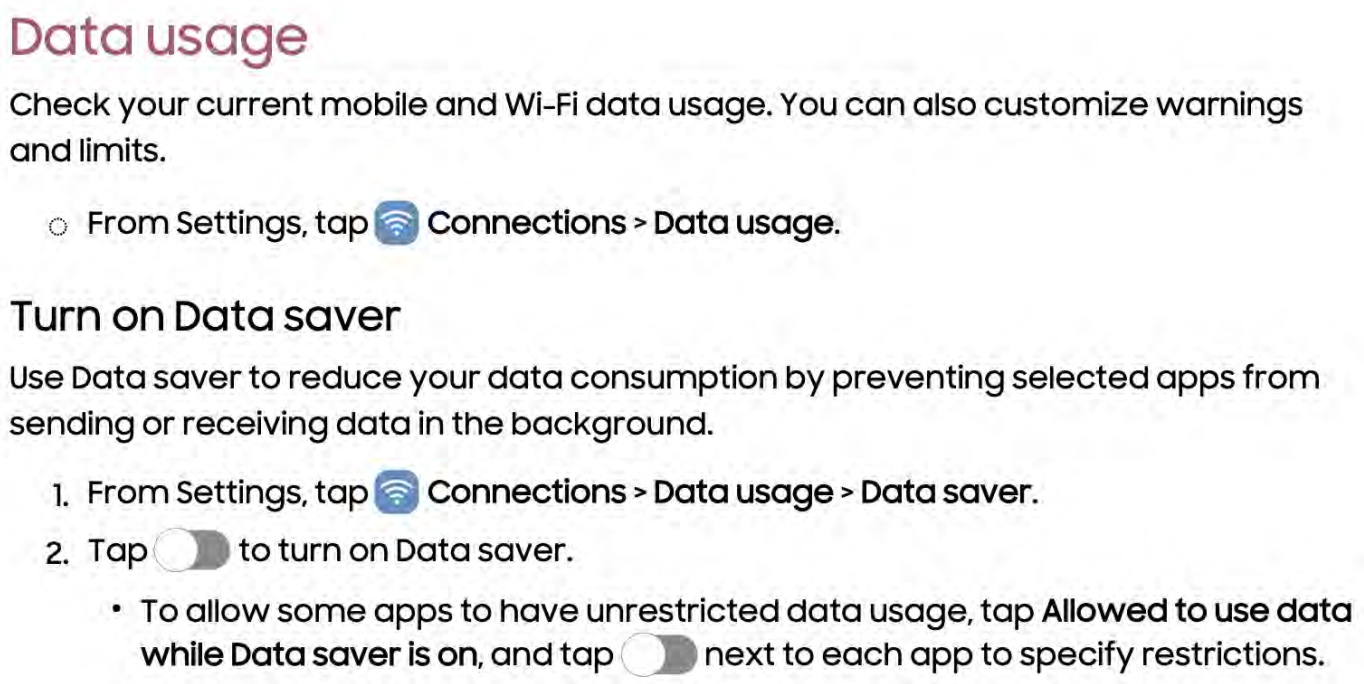
Claim	Public Documentation
	Instance Property **applicationState** The app's current state, or that of its most active scene. iOS 4.0+ iPadOS 4.0+ Mac Catalyst 13.1+ tvOS 9.0+ visionOS 1.0+ Beta `var applicationState: UIApplication.State { get }` **Discussion** The behavior of this property depends on whether your app is scene-based. In a scene-based app, this property takes the value of the most active scene, which it determines from each scene's `activationState` property. A scene-based app launches in the background state, and transitions between its states as scenes connect, change their states, and disconnect. For scene-based apps, use `UISceneDelegate` to respond to changes in an individual scene's life cycle. In a sceneless app, the property's value is always the app's current state. The app is inactive at launch, and then is generally in either an active or background state. The app may become inactive for a short period — for example, when transitioning between active and background states, when the system presents an alert in front of it, or when the system displays the application switcher. For sceneless apps, use `UIApplicationDelegate` to respond to the app's life cycle changes. ; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/;

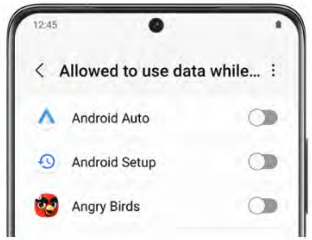
Claim	Public Documentation
	https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks https://developer.apple.com/documentation/backgroundtasks/bgapprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocessingtask; https://developer.apple.com/documentation/backgroundtasks/bgtask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_foreground/; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate; https://developer.apple.com/documentation/uikit/uiapplication/state; https://developer.apple.com/documentation/foundation/url_loading_system; https://developer.apple.com/documentation/foundation/urlsession; https://developer.apple.com/documentation/avfoundation/avplayer; https://developer.apple.com/documentation/avfoundation/media_playback/configuring_your_app_for_media_playback; https://developer.apple.com/videos/play/wwdc2019/707/; https://developer.apple.com/videos/play/wwdc2020/10063:

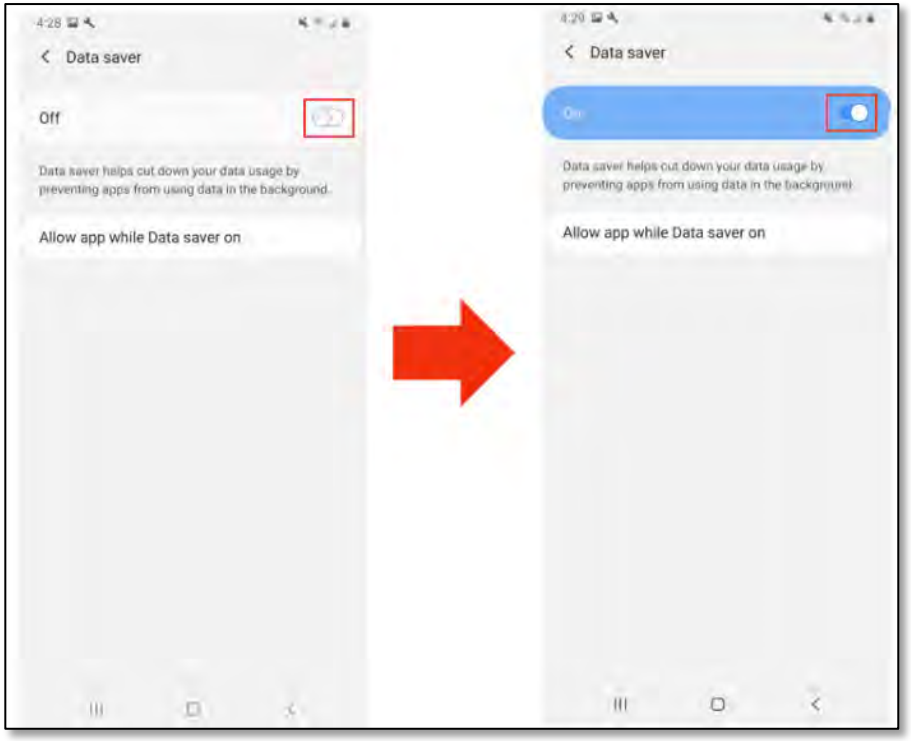
Claim	Public Documentation

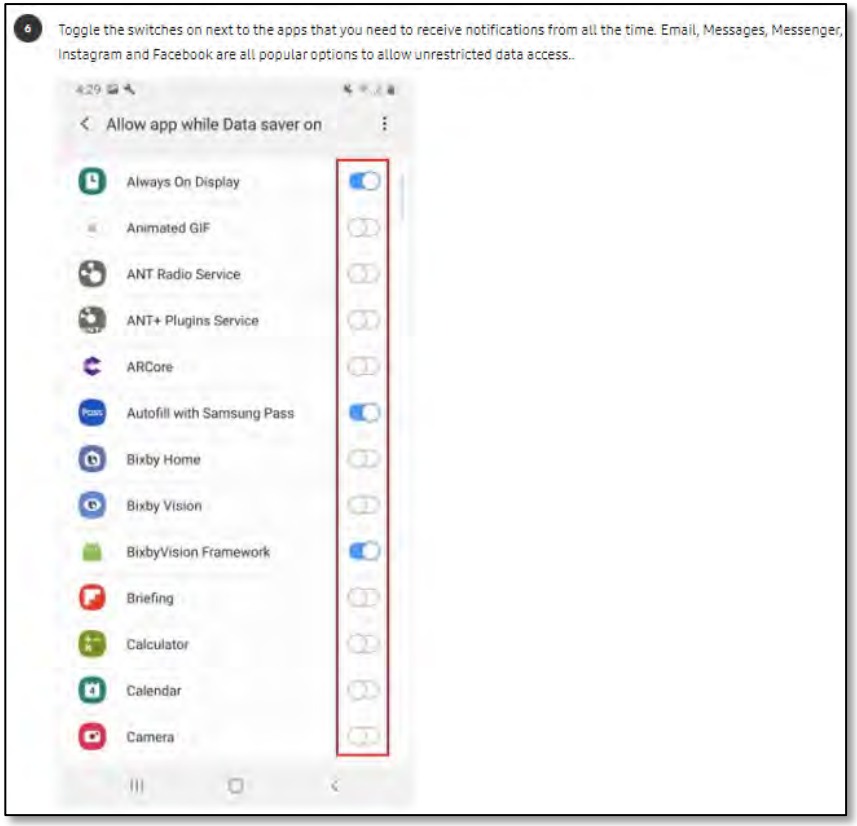

Top factors
Critically low battery
Low Power Mode
App usage
App switcher
Background App Refresh switch
System budgets
Rate limiting

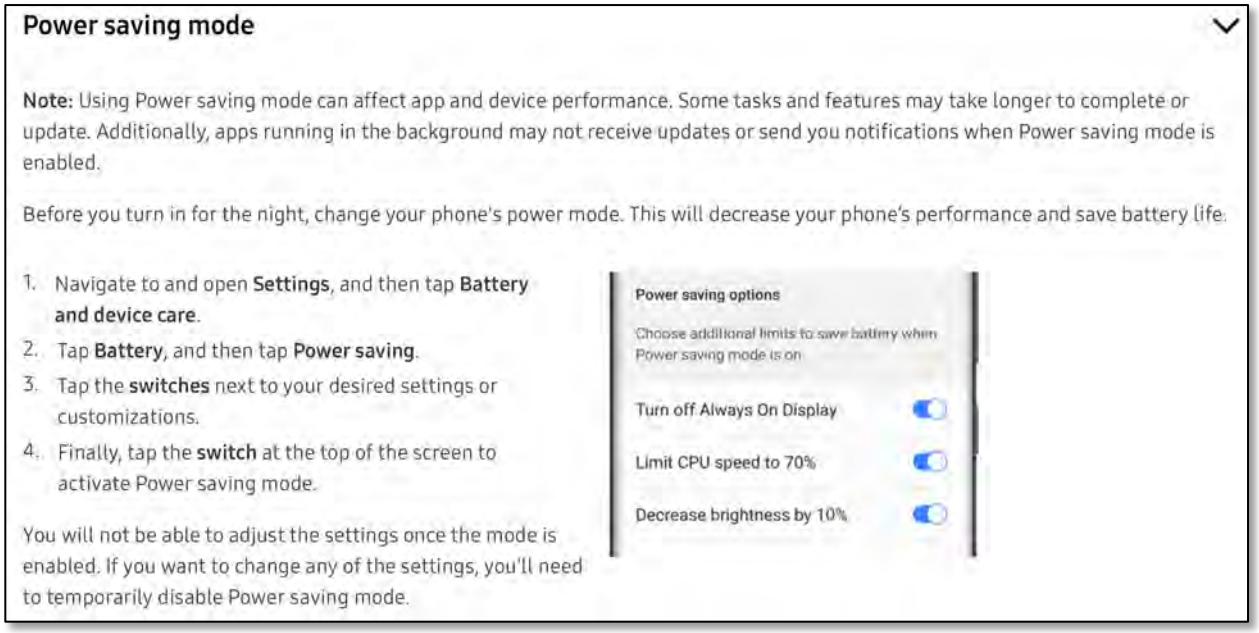
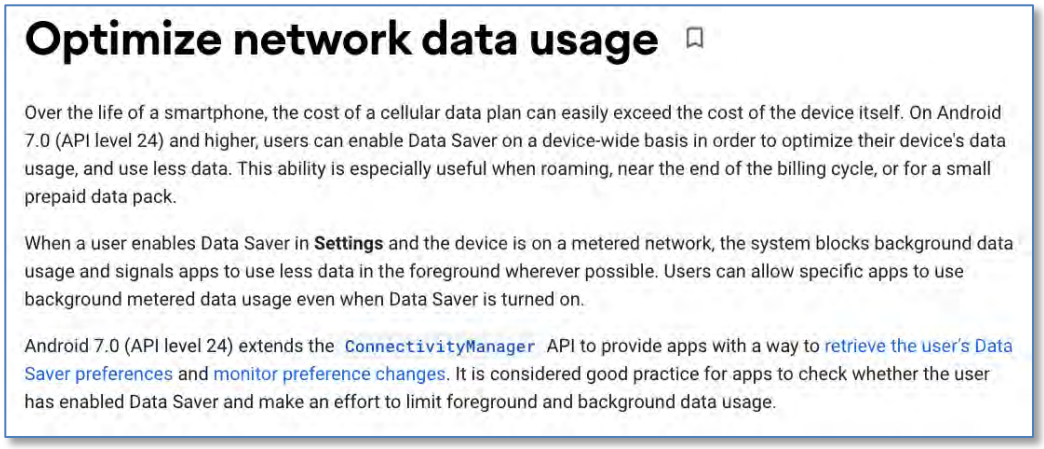
Claim	Public Documentation
[1k] selectively allow or deny one or more Internet service activities by or on behalf of the particular application based on whether or not the particular application is one of the first one or more applications, the differential traffic control policy, including any applicable user augmentation of the differential traffic control policy, and the classifications performed by the one or more processors.	The Accused Instrumentalities "selectively allow or deny one or more Internet service activities by or on behalf of the particular application based on whether or not the particular application is one of the first one or more applications, the differential traffic control policy, including any applicable user augmentation of the differential traffic control policy, and the classifications performed by the one or more processors." For example, phones and tablets sold and used by T-Mobile allow or deny internet service activities by or on behalf of applications based on classifications of particular applications and policies. *See, e.g.*, https://www.t-mobile.com/support/public-files/attachments/samsung/samsung-galaxy-s21-fe-5g/Samsung%20Galaxy%20S21%20FE%205G_English%20User%20Guide_FINAL2.pdf:

Claim	Public Documentation
	 ; https://www.samsung.com/us/support/answer/ANS00079018/:

Claim	Public Documentation
	Turn Data saver on or off Data saver prevents some apps from sending or receiving data in the background. So rest assured, you're not wasting any precious data. 1. Navigate to and open **Settings**, and then tap **Connections**. 2. Tap **Data usage**, tap **Data saver**, and then tap the **switch** next to Turn on now. 3. If there are still some apps you'd like to run in the background, you can set them as exceptions. Tap **Allowed to use data while Data saver is on** at the bottom of the screen. 4. Tap **More options** (the three vertical dots) and choose **Show system apps** or **Show allowed apps first** to narrow down the list. 5. Finally, tap the **switch(es)** next to your desired app(s).  ; https://www.samsung.com/ae/support/mobile-devices/android-pie-what-is-the-data-saver-feature/:

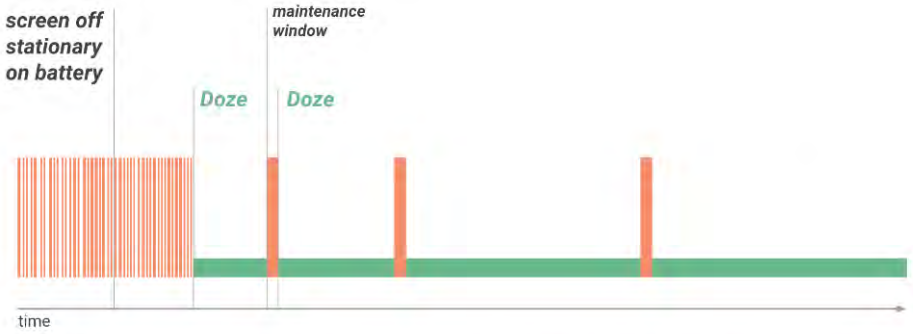
Claim	Public Documentation
	

Claim	Public Documentation
	 ; https://www.samsung.com/us/support/answer/ANS00078987/:

Claim	Public Documentation
	 ; https://developer.android.com/training/basics/network-ops/data-saver: 

Claim	Public Documentation

	Check data saver preferences
	
	On Android 7.0 (API level 24) and higher, apps can use the `ConnectivityManager` API to determine what data usage restrictions are being applied. The `getRestrictBackgroundStatus()` method returns one of the following values:
	
	`RESTRICT_BACKGROUND_STATUS_DISABLED`
	Data Saver is disabled.
	
	`RESTRICT_BACKGROUND_STATUS_ENABLED`
	The user has enabled Data Saver for this app. Apps should make an effort to limit data usage in the foreground and gracefully handle restrictions to background data usage.
	
	`RESTRICT_BACKGROUND_STATUS_WHITELISTED`
	The user has enabled Data Saver but the app is allowed to bypass it. Apps should still make an effort to limit foreground and background data usage.
	
	Limit data usage whenever the device is connected to a metered network, even if Data Saver is disabled or the app is allowed to bypass it. The following sample code uses `ConnectivityManager.isActiveNetworkMetered()` and `ConnectivityManager.getRestrictBackgroundStatus()` to determine how much data the app should use:
	
	; https://developer.android.com/training/monitoring-device-state/doze-standby:
	
	Optimize for Doze and App Standby
	
	Starting from Android 6.0 (API level 23), Android introduces two power-saving features that extend battery life for users by managing how apps behave when a device is not connected to a power source. *Doze* reduces battery consumption by deferring background CPU and network activity for apps when the device is unused for long periods of time. *App Standby* defers background network activity for apps with which the user has not recently interacted.
	
	While the device is in Doze, apps' access to certain battery-intensive resources is deferred until maintenance windows. The specific restrictions are listed in Power Management Restrictions.
	
	Doze and App Standby manage the behavior of all apps running on Android 6.0 or higher, regardless whether they are specifically targeting API level 23. To ensure the best experience for users, test your app in Doze and App Standby modes and make any necessary adjustments to your code. The sections below provide details.

Claim	Public Documentation
	Understanding Doze If a user leaves a device unplugged and stationary for a period of time, with the screen off, the device enters Doze mode. In Doze mode, the system attempts to conserve battery by restricting apps' access to network and CPU-intensive services. It also prevents apps from accessing the network and defers their jobs, syncs, and standard alarms. Periodically, the system exits Doze for a brief time to let apps complete their deferred activities. During this *maintenance window*, the system runs all pending syncs, jobs, and alarms, and lets apps access the network.  **Figure 1.** Doze provides a recurring maintenance window for apps to use the network and handle pending activities. At the conclusion of each maintenance window, the system again enters Doze, suspending network access and deferring jobs, syncs, and alarms. Over time, the system schedules maintenance windows less and less frequently, helping to reduce battery consumption in cases of longer-term inactivity when the device is not connected to a charger. As soon as the user wakes the device by moving it, turning on the screen, or connecting a charger, the system exits Doze and all apps return to normal activity. The Doze restriction on network access is also likely to affect your app, especially if the app relies on real-time messages such as tickles or notifications. If your app requires a persistent connection to the network to receive messages, you should use Firebase Cloud Messaging (FCM) if possible. ; https://developer.android.com/topic/performance/appstandby:

App Standby Buckets

Android 9 (API level 28) and higher support **App Standby Buckets**. App Standby Buckets help the system prioritize apps' requests for resources based on how recently and how frequently the apps are used. Based on app usage patterns, each app is placed in one of five priority **buckets**. The system limits the device resources available to each app based on which bucket the app is in.

Priority buckets

The system dynamically assigns each app to a priority bucket, reassigning the apps as needed. The system may rely on a preloaded app that uses machine learning to determine how likely each app is to be used, and assigns apps to the appropriate buckets. If the system app is not present on a device, the system defaults to sorting apps based on how recently they were used. More active apps are assigned to buckets that give the apps higher priority, making more system resources available to the app. In particular, the bucket determines how frequently the app's jobs run, and how often the app can trigger alarms. These restrictions apply only while the device is on battery power; the system does not impose these restrictions on apps while the device is charging.

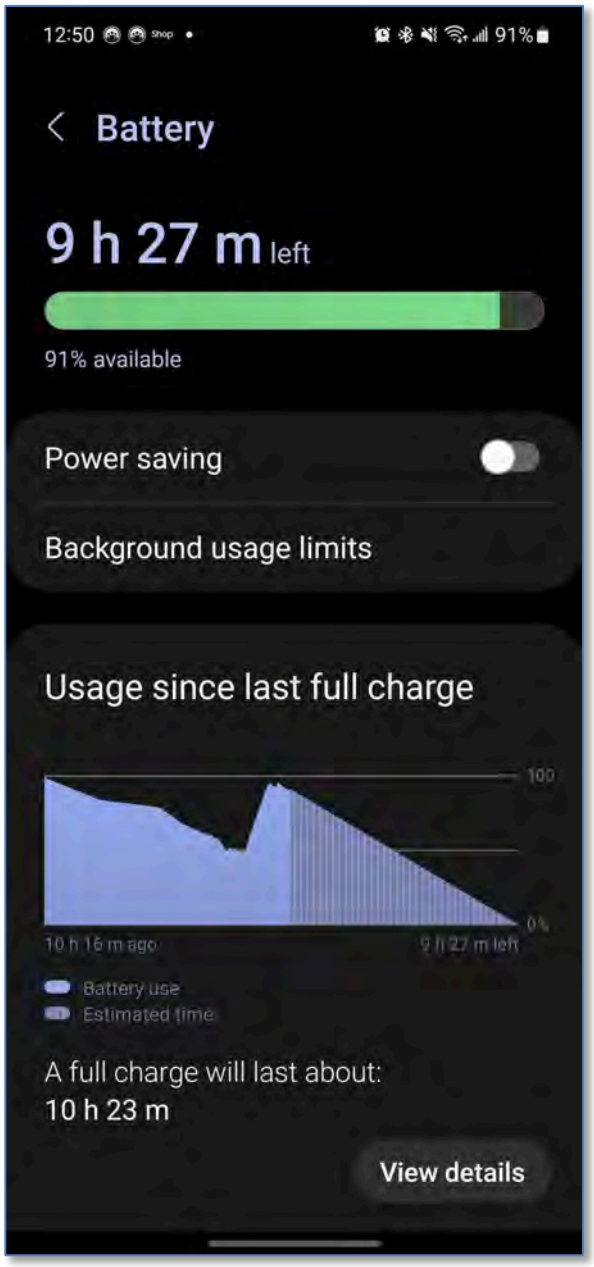
Note: Every manufacturer can set their own criteria for how non-active apps are assigned to buckets. You should not try to influence which bucket your app is assigned to. Instead, focus on making sure your app behaves well in whatever bucket it might be in. Your app can find out what bucket it's currently in by calling `UsageStatsManager.getAppStandbyBucket()`.

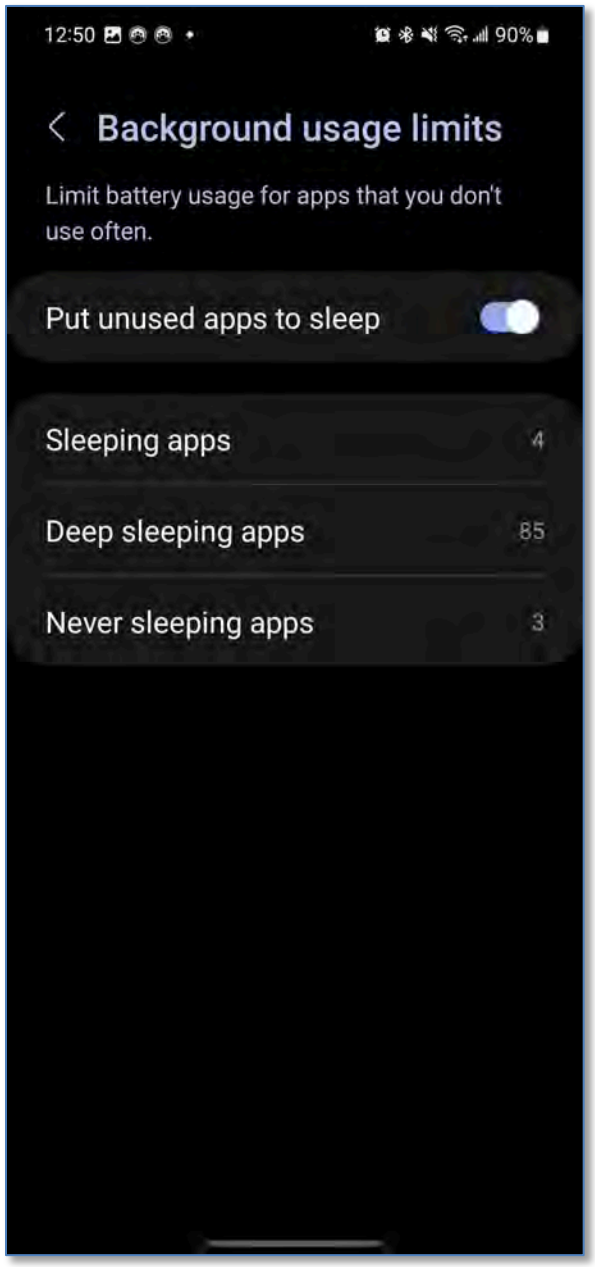
The buckets are:

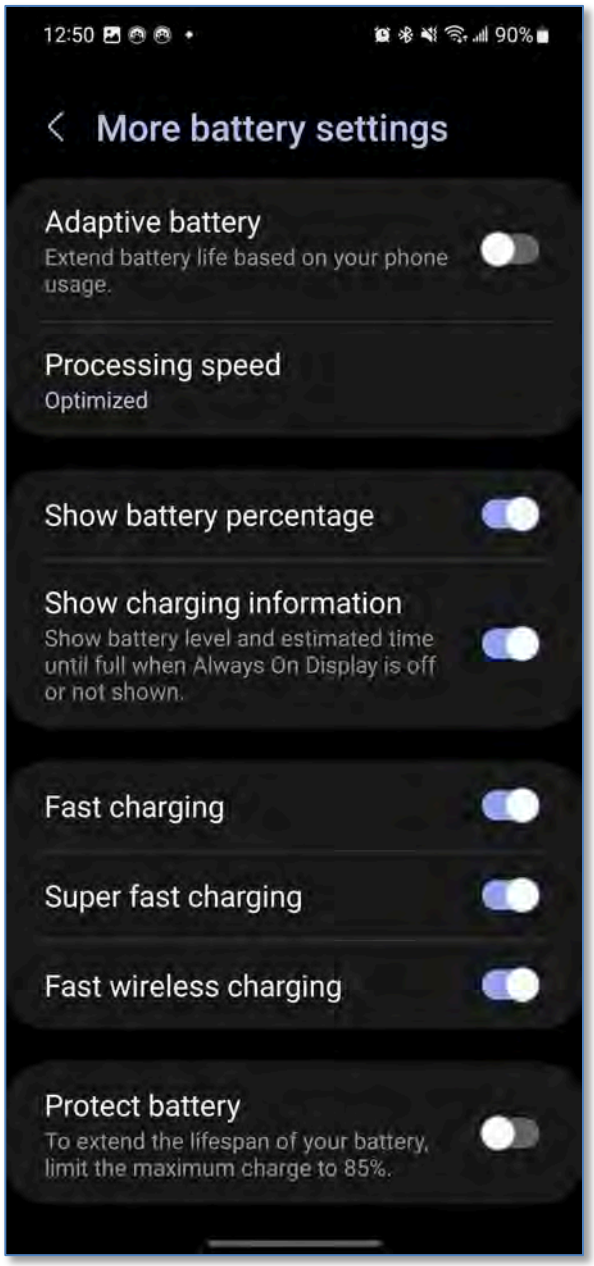
1. Active: App is currently being used or was very recently used.
2. Working set: App is in regular use.
3. Frequent: App is often used, but not every day.
4. Rare: App is not frequently used.
5. Restricted: App consumes a great deal of system resources, or may exhibit undesirable behavior.

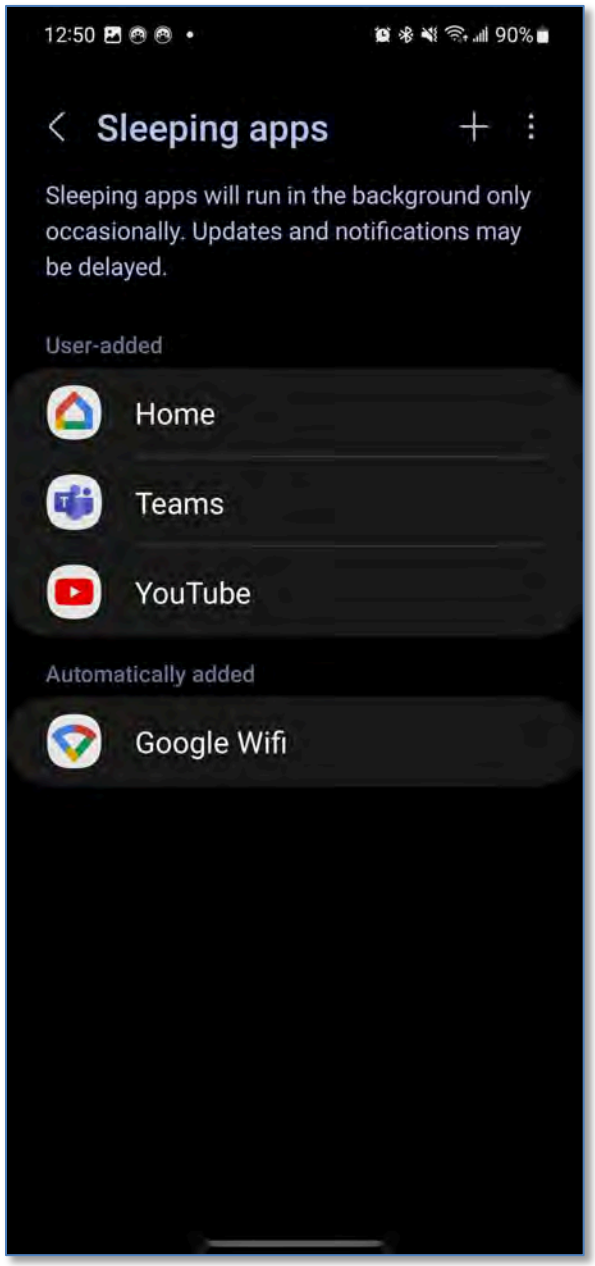
In addition, there's a special **never** bucket for apps that have been installed but have never been run. The system imposes severe restrictions on these apps.

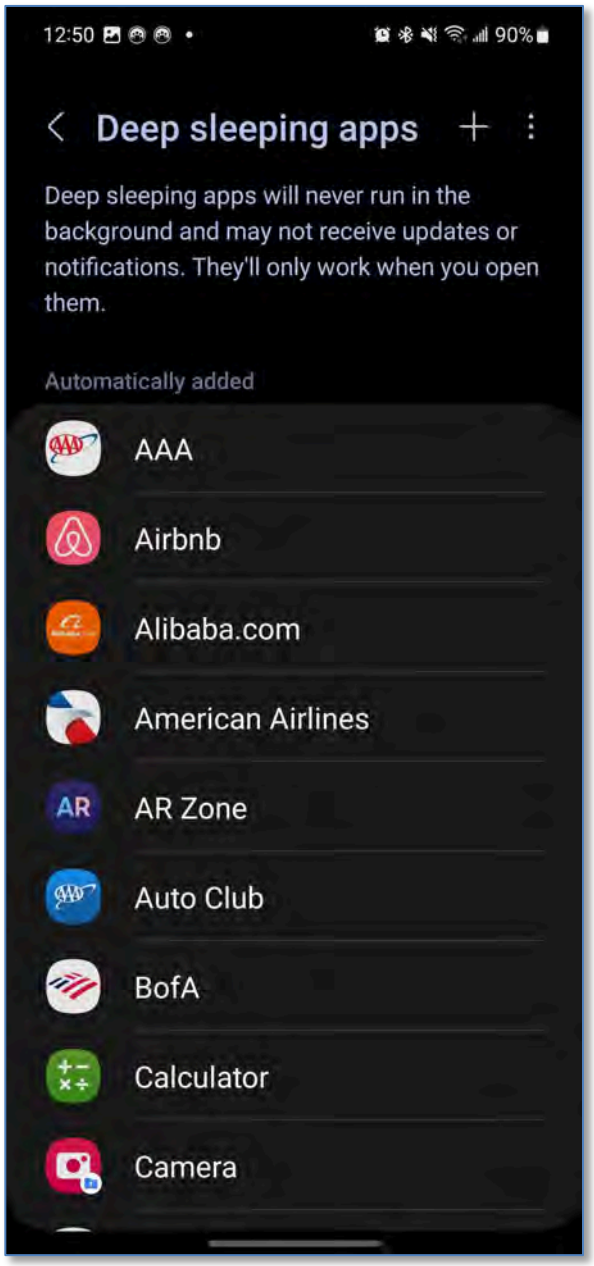
Claim	Public Documentation
	; https://developer.android.com/topic/performance/power/power-details; https://developer.android.com/topic/performance/background-optimization; https://developer.android.com/reference/android/app/job/JobScheduler; https://developer.android.com/guide/background/persistent; https://developer.android.com/guide/components/activities/process-lifecycle; https://developer.android.com/guide/background; https://developer.android.com/about/versions/pie/android-9.0; https://developer.android.com/training/basics/network-ops/reading-network-state; https://developer.android.com/training/connectivity/network-access-optimization; https://developer.android.com/reference/android/net/NetworkCapabilities. *see also* the exemplary screenshots below:

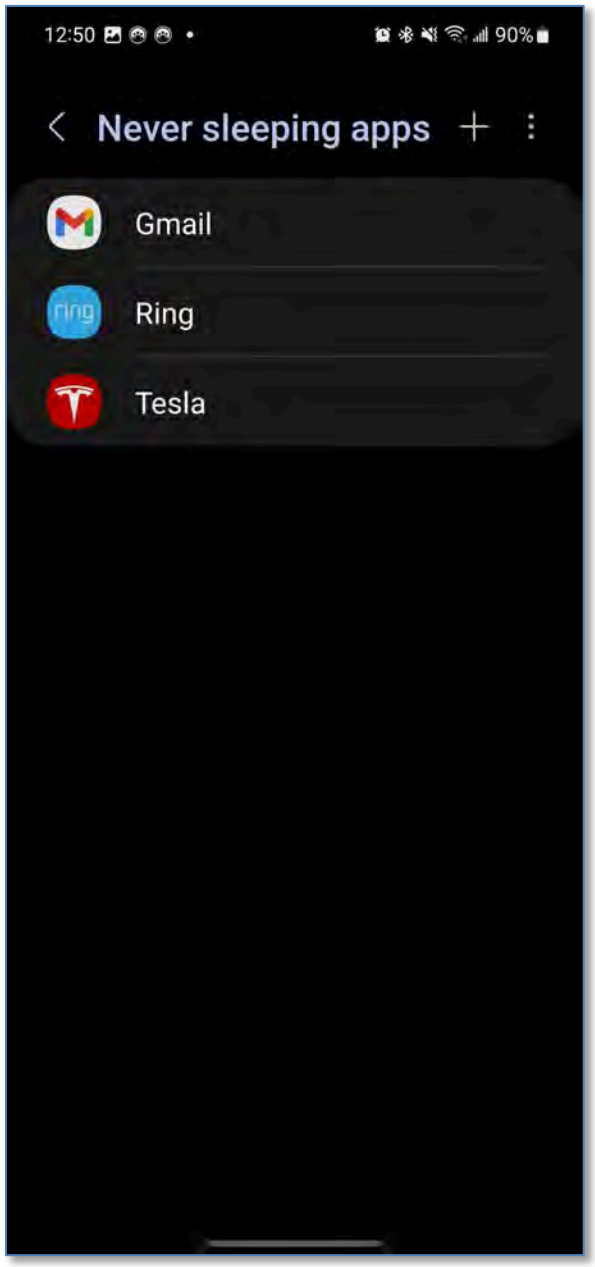

12:50
91%
Battery
9 h 27 m left
91% available
Power saving
Background usage limits
Usage since last full charge
100
0%
10 h 16 m ago
9 h 27 m left
Battery use
Estimated time
A full charge will last about:
10 h 23 m
View details

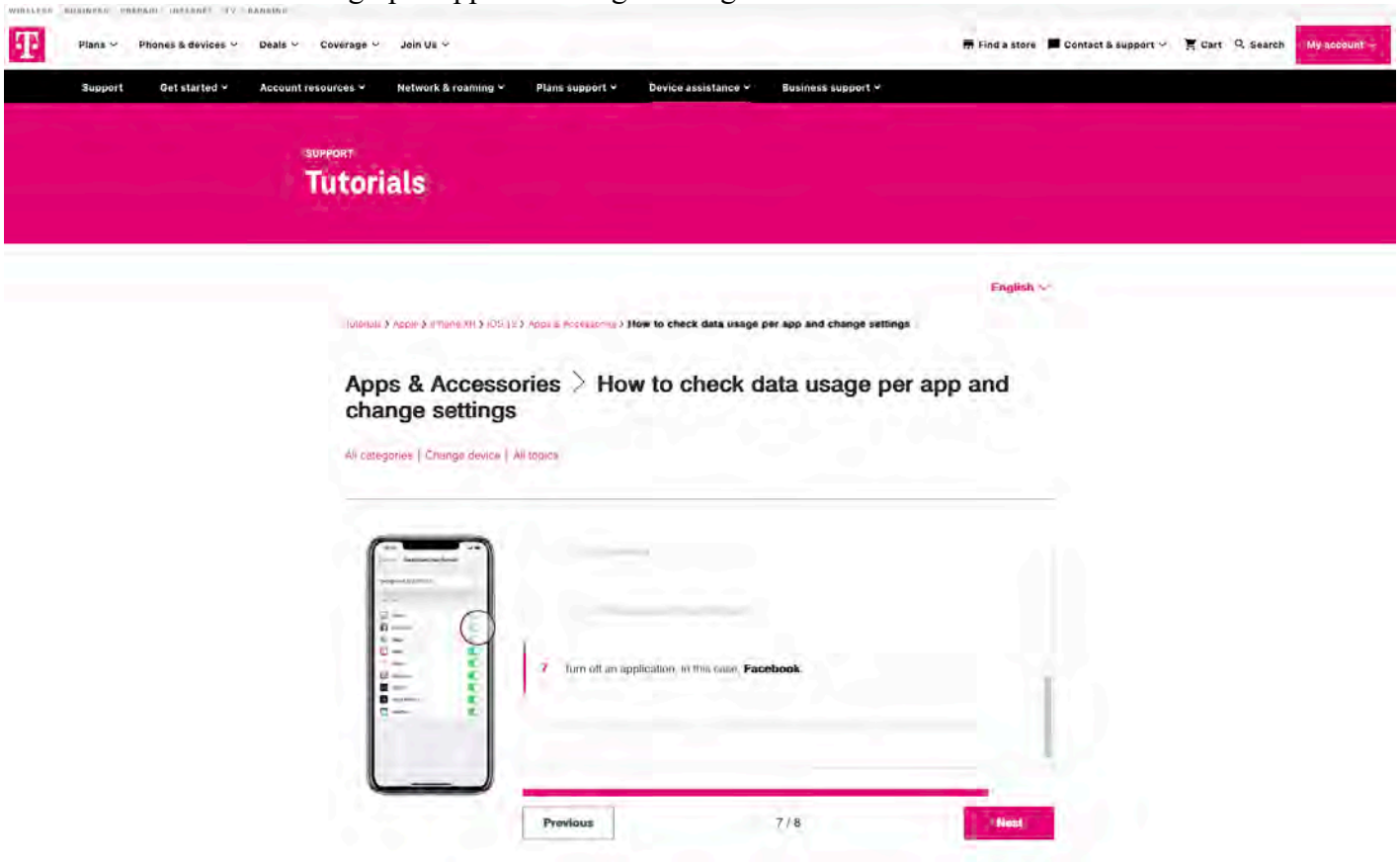

12:50
90%
Background usage limits
Limit battery usage for apps that you don't use often.
Put unused apps to sleep
Sleeping apps 4
Deep sleeping apps 85
Never sleeping apps 3

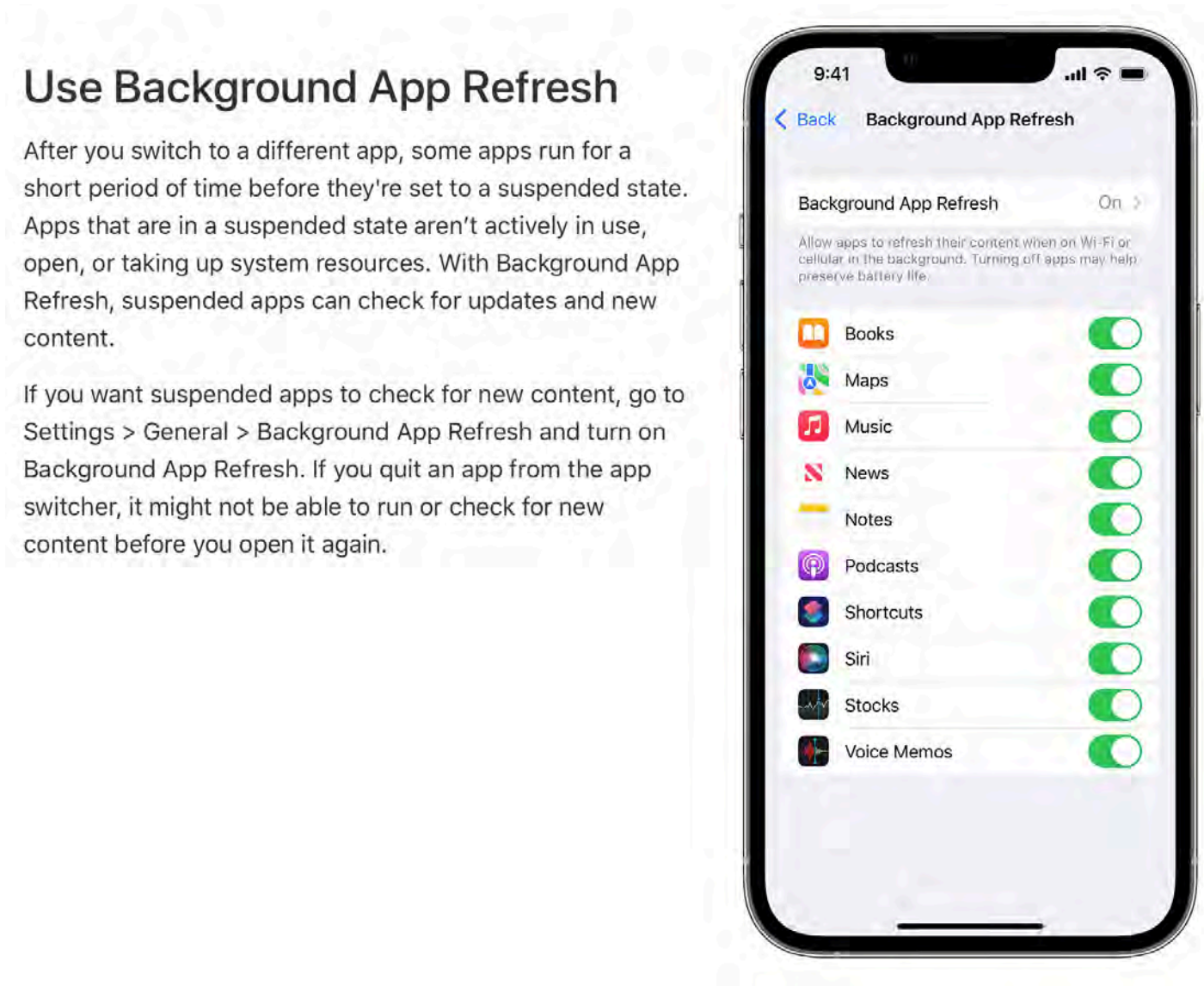

12:50
90%
More battery settings
Adaptive battery
Extend battery life based on your phone usage.
Processing speed
Optimized
Show battery percentage
Show charging information
Show battery level and estimated time until full when Always On Display is off or not shown.
Fast charging
Super fast charging
Fast wireless charging
Protect battery
To extend the lifespan of your battery, limit the maximum charge to 85%.


12:50
90%
Sleeping apps
Sleeping apps will run in the background only occasionally. Updates and notifications may be delayed.
User-added
Home
Teams
YouTube
Automatically added
Google Wifi


12:50
90%
Deep sleeping apps
Deep sleeping apps will never run in the background and may not receive updates or notifications. They'll only work when you open them.
Automatically added
AAA
Airbnb
Alibaba.com
American Airlines
AR Zone
Auto Club
BofA
Calculator
Camera


12:50
90%
Never sleeping apps
Gmail
Ring
Tesla

Claim	Public Documentation
	See also e.g., https://www.t-mobile.com/support/tutorials/device/apple/iphone-xr/topic/apps-amp-accessories/how-to-check-data-usage-per-app-and-change-settings/7  ; https://support.apple.com/en-us/HT202070:

Claim	Public Documentation
	 https://support.apple.com/en-us/HT205234:

Use Low Power Mode to save battery life on your iPhone or iPad

Low Power Mode reduces the amount of power that your iPhone or iPad uses when the battery gets low.

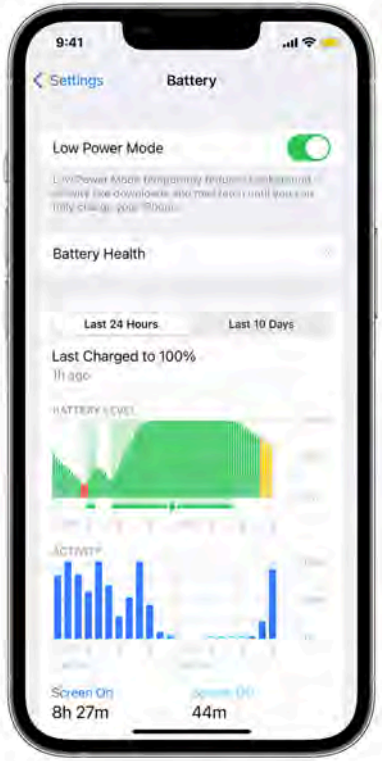
To turn Low Power Mode on or off, go to Settings > Battery. You can also turn Low Power Mode on and off from Control Center. Go to Settings > Control Center > Customize Controls, then select Low Power Mode to add it to Control Center.

When Low Power Mode is on, your iPhone or iPad will last longer before you need to charge it, but some features might take longer to update or complete. Also, some tasks might not work until you turn off Low Power Mode, or until you charge your iPhone or iPad to 80% or higher.

Low Power Mode reduces or affects these features:

- 5G (except for video streaming) on iPhone 12 and iPhone 13 models[1]
- Auto-Lock (defaults to 30 seconds)
- Display brightness
- Display refresh rate (limited up to 60 Hz) on iPhone and iPad models with ProMotion display[2]
- Some visual effects
- iCloud Photos (temporarily paused)
- Automatic downloads
- Email fetch
- Background app refresh

When Low Power Mode is on, the battery in the status bar will be yellow. You'll see a yellow battery icon and the battery percentage. After you charge your iPhone or iPad to 80% or higher, Low Power Mode automatically turns off.



1. If you turn on Low Power Mode, 5G is disabled, except in some cases like video streaming and large downloads on iPhone 12 and iPhone 13 models. With iPhone 12 models, Low Power Mode disables 5G standalone (where available).

2. These devices have ProMotion display: iPhone 13 Pro and later, iPhone 13 Pro Max and later, iPad Pro 10.5-inch, all iPad Pro 11-inch models, and iPad Pro 12.9-inch (2nd generation) and later.

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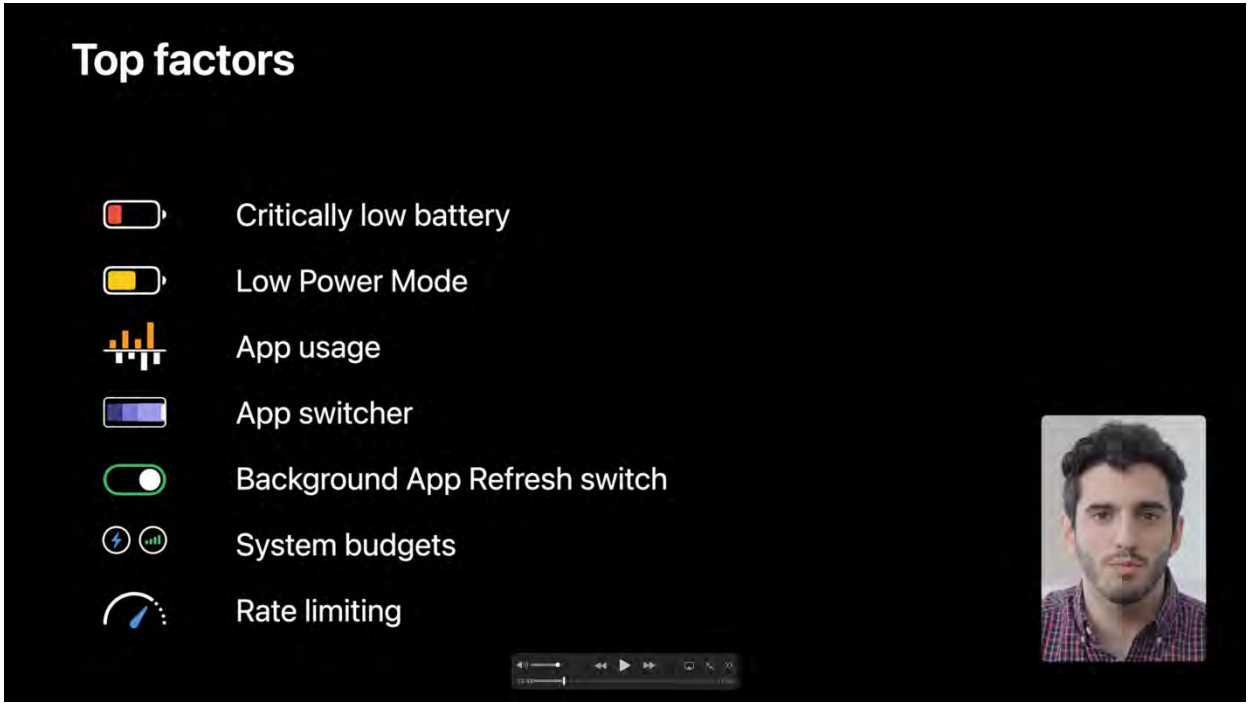
	https://www.apple.com/batteries/maximizing-performance/: **View Battery Usage information** With iOS, you can easily manage your device's battery life, because you can see the proportion of your battery used by each app (unless the device is charging). To view your usage, go to Settings > Battery. Here are the messages you may see listed below the apps you've been using: **Background Activity.** This indicates that the battery was used by the app while it was in the background — that is, while you were using another app. • To improve battery life, you can turn off the feature that allows apps to refresh in the background. Go to Settings > General > Background App Refresh and select Wi-Fi, Wi-Fi & Cellular Data, or Off to turn off Background App Refresh entirely. • If the Mail app lists Background Activity, you can choose to fetch data manually or increase the fetch interval. Go to Settings > Accounts & Passwords > Fetch New Data. ; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate; https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/about_the_background_execution_sequence/; https://developer.apple.com/documentation/uikit/app_and_environment/scenes/preparing_your_ui_to_run_in_the_background/extending_your_app_s_background_execution_time/; https://developer.apple.com/documentation/backgroundtasks/; https://developer.apple.com/documentation/watchkit/background_execution/using_background_tasks/;

Claim	Public Documentation
	https://developer.apple.com/documentation/uikit/windows_and_screens/scenes/preparing_your_ui_to_run_in_the_background/using_background_tasks_to_update_your_app/; https://developer.apple.com/documentation/backgroundtasks/refreshing_and_maintaining_your_app_using_background_tasks/; https://developer.apple.com/documentation/backgroundtasks https://developer.apple.com/documentation/backgroundtasks/bgapprefreshtask; https://developer.apple.com/documentation/backgroundtasks/bgprocessingtask; https://developer.apple.com/documentation/backgroundtasks/bgtask; https://developer.apple.com/documentation/uikit/uiapplication/1622976-backgroundfetchintervalminimum/; https://developer.apple.com/documentation/uikit/uiapplication/1622994-backgroundrefreshstatus/; https://developer.apple.com/documentation/uikit/uiapplication/1623003-applicationstate; https://developer.apple.com/documentation/uikit/uiapplication/state; https://developer.apple.com/documentation/foundation/url_loading_system; https://developer.apple.com/documentation/foundation/urlsession; https://developer.apple.com/documentation/avfoundation/avplayer; https://developer.apple.com/documentation/avfoundation/media_playback/configuring_your_app_for_media_playback; https://developer.apple.com/videos/play/wwdc2019/707/; https://developer.apple.com/videos/play/wwdc2020/10063:

Claim	Public Documentation

Claim	Public Documentation
	

Claim	Public Documentation
	 ; *see also, e.g.,* https://www.t-mobile.com/cell-phone-plans; https://www.t-mobile.com/cell-phone-plans/affordable-data-plans; https://www.t-mobile.com/business?INTNAV=tNav%3ABusiness; https://prepaid.t-mobile.com; https://www.t-mobile.com/cell-phone-plans/international-roaming-plans; https://www.t-mobile.com/support/coverage/domestic-roaming-data; https://www.t-mobile.com/customers/unlimited-roaming-sms-data; https://www.t-mobile.com/apps/t-mobile-app; https://www.t-mobile.com/apps/t-mobile-family-mode; https://www.t-mobile.com/support/devices/not-sold-by-t-mobile/byod-t-mobile-data-and-apn-settings; https://www.t-mobile.com/support/tutorials/device/apple/iphone-x/topic/connections-amp-network/apn-and-data-settings.
2. The wireless end-user device of claim 1, wherein based on the differential traffic control policy the one or more processors selectively deny one or more Internet service activities by or on behalf of	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 1, wherein based on the differential traffic control policy the one or more processors selectively deny one or more Internet service activities by or on behalf of the particular application when the particular application is one of the first one or more applications, the classified wireless network is a WWAN type, and the particular application is classified as not interacting with the user in the device user interface foreground."

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the particular application when the particular application is one of the first one or more applications, the classified wireless network is a WWAN type, and the particular application is classified as not interacting with the user in the device user interface foreground.	*See*, for example, the disclosures identified for claim 1.
3. The wireless end-user device of claim 2, wherein the one or more processors are further configured to override the selective denial of one or more Internet service activities by or on behalf of the particular application when the user has augmented the differential traffic control policy so as to indicate that Internet service activities are allowable when the classified wireless network is the WWAN type, and the particular application is classified as not interacting with the user in the device user interface foreground.	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 2, wherein the one or more processors are further configured to override the selective denial of one or more Internet service activities by or on behalf of the particular application when the user has augmented the differential traffic control policy so as to indicate that Internet service activities are allowable when the classified wireless network is the WWAN type, and the particular application is classified as not interacting with the user in the device user interface foreground." *See*, for example, the disclosures identified for claims 1-2.
4. The wireless end-user device of claim 2, wherein based on the differential traffic control policy the one or more processors selectively allow one or more Internet service activities by or on behalf of the particular application when the	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 2, wherein based on the differential traffic control policy the one or more processors selectively allow one or more Internet service activities by or on behalf of the particular application when the particular application is one of the first one or more applications, the classified wireless network is the WWAN type, and the particular application is classified as interacting with the user in the device user interface foreground."

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particular application is one of the first one or more applications, the classified wireless network is the WWAN type, and the particular application is classified as interacting with the user in the device user interface foreground.	*See*, for example, the disclosures identified for claims 1-2.
5. The wireless end-user device of claim 1, wherein based on the differential traffic control policy the one or more processors selectively allow one or more Internet service activities by or on behalf of a second particular application and/or service when the second particular application and/or service is one of the second one or more applications and/or services and the classified wireless network is the WWAN type.	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 1, wherein based on the differential traffic control policy the one or more processors selectively allow one or more Internet service activities by or on behalf of a second particular application and/or service when the second particular application and/or service is one of the second one or more applications and/or services and the classified wireless network is the WWAN type." *See*, for example, the disclosures identified for claim 1.
6. The wireless end-user device of claim 1, wherein the one or more processors are configured to classify that the particular application is interacting with the user in the device user interface foreground when the user of the device is directly interacting with that application or perceiving any benefit from that application.	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 1, wherein the one or more processors are configured to classify that the particular application is interacting with the user in the device user interface foreground when the user of the device is directly interacting with that application or perceiving any benefit from that application." *See*, for example, the disclosures identified for claim 1.

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7. The wireless end-user device of claim 1, wherein the user interface is further to provide the user of the device with information regarding why the differential traffic control policy is applied to the particular application.	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 1, wherein the user interface is further to provide the user of the device with information regarding why the differential traffic control policy is applied to the particular application." *See*, for example, the disclosures identified for claim 1.
8. The wireless end-user device of claim 1, wherein the differential traffic control policy is part of a multimode profile having different policies for different ones of the network types.	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 1, wherein the differential traffic control policy is part of a multimode profile having different policies for different ones of the network types." *See*, for example, the disclosures identified for claim 1.
9. The wireless end-user device of claim 8, wherein the one or more processors are further configured to select a traffic control policy from the multimode profile based at least in part on the classified wireless network type.	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 8, wherein the one or more processors are further configured to select a traffic control policy from the multimode profile based at least in part on the classified wireless network type." *See*, for example, the disclosures identified for claims 1 and 8.
10. The wireless end-user device of claim 9, wherein the one or more processors are further configured to, when the classified wireless network type is at least one type of WLAN, select the traffic control policy from the multimode profile based at least in part on a type of network connection from the WLAN to the Internet.	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 9, wherein the one or more processors are further configured to, when the classified wireless network type is at least one type of WLAN, select the traffic control policy from the multimode profile based at least in part on a type of network connection from the WLAN to the Internet." *See*, for example, the disclosures identified for claim 1 and 9.

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11. The wireless end-user device of claim 1, wherein the plurality of network types include three or more of 2G, 3G, 4G, home, roaming, and WiFi.	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 1, wherein the plurality of network types include three or more of 2G, 3G, 4G, home, roaming, and WiFi." *See*, for example, the disclosures identified for claim 1.
12. The wireless end-user device of claim 1, the one or more processors further configured to receive an update to at least a portion of the differential traffic control policy list from a network element.	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 1, the one or more processors further configured to receive an update to at least a portion of the differential traffic control policy list from a network element." *See*, for example, the disclosures identified for claim 1. As yet another example, the one or more processors are configured to receive portions of policies from a network element. *See, e.g.,* https://www.t-mobile.com/cell-phone-plans; https://www.t-mobile.com/cell-phone-plans/affordable-data-plans; https://www.t-mobile.com/business?INTNAV=tNav%3ABusiness; https://prepaid.t-mobile.com; https://www.t-mobile.com/cell-phone-plans/international-roaming-plans; https://www.t-mobile.com/support/coverage/domestic-roaming-data; https://www.t-mobile.com/customers/unlimited-roaming-sms-data; https://www.t-mobile.com/apps/t-mobile-app; https://www.t-mobile.com/apps/t-mobile-family-mode; https://www.t-mobile.com/support/devices/not-sold-by-t-mobile/byod-t-mobile-data-and-apn-settings; https://www.t-mobile.com/support/tutorials/device/apple/iphone-x/topic/connections-amp-network/apn-and-data-settings; https://developer.android.com/about/versions/pie/android-9.0:

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	Data cost sensitivity in JobScheduler Beginning in Android 9, `JobScheduler` can use network status signals provided by carriers to improve the handling of network-related jobs. Jobs can declare their estimated data size, signal prefetching, and specify detailed network requirements. `JobScheduler` then manages work according to the network status. For example, when the network signals that it is congested, `JobScheduler` might defer large network requests. When on an unmetered network, `JobScheduler` can run prefetch jobs to improve the user experience, such as by prefetching headlines. When adding jobs, make sure to use `setEstimatedNetworkBytes()`, `setPrefetch()`, and `setRequiredNetwork()` when appropriate to help `JobScheduler` handle the work properly. When your job executes, be sure to use the `Network` object returned by `JobParameters.getNetwork()`. Otherwise you'll implicitly use the device's default network which may not meet your requirements, causing unintended data usage. ; https://developer.android.com/training/basics/network-ops/reading-network-state; https://developer.android.com/training/connectivity/network-access-optimization; https://developer.android.com/reference/android/net/NetworkCapabilities.
13. The wireless end-user device of claim 1, wherein the plurality of network types include a roaming WWAN type and a home WWAN type, and the one or more processors are to apply the differential traffic control policy to one of but not both of the roaming WWAN type and the home WWAN type.	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 1, wherein the plurality of network types include a roaming WWAN type and a home WWAN type, and the one or more processors are to apply the differential traffic control policy to one of but not both of the roaming WWAN type and the home WWAN type." *See*, for example, the disclosures identified for claim 1.
14. The wireless end-user device of claim 1, wherein the plurality of network types include the WWAN	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 1, wherein the plurality of network types include the WWAN type and a WLAN type, and the one or more processors are to apply the differential traffic control policy to one of but not both of the WWAN type and the WLAN type."

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type and a WLAN type, and the one or more processors are to apply the differential traffic control policy to one of but not both of the WWAN type and the WLAN type.	*See*, for example, the disclosures identified for claim 1.
15. The wireless end-user device of claim 1, wherein the one or more processors are further configured to dynamically change the application of the differential traffic control policy based on a power state of the device.	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 1, wherein the one or more processors are further configured to dynamically change the application of the differential traffic control policy based on a power state of the device." *See*, for example, the disclosures identified for claim 1.
16. The wireless end-user device of claim 1, wherein the one or more processors are further configured to dynamically change the application of the differential traffic control policy based on a device usage state.	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 1, wherein the one or more processors are further configured to dynamically change the application of the differential traffic control policy based on a device usage state." *See*, for example, the disclosures identified for claim 1.
17. The wireless end-user device of claim 1, wherein the one or more processors are further configured to dynamically change the application of the differential traffic control policy based on power control state changes for one or more of the modems.	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 1, wherein the one or more processors are further configured to dynamically change the application of the differential traffic control policy based on power control state changes for one or more of the modems." *See*, for example, the disclosures identified for claim 1. As a further example, the one or more processors change policies based on power control state changes of modems. *See, e.g.,* https://developer.android.com/training/connectivity/network-access-optimization.

Claim	Public Documentation

The radio state machine

The wireless radio on your user's device has built-in power-saving features that help minimize the amount of battery power it consumes. When fully active, the wireless radio consumes significant power, but when inactive or in standby, the radio consumes very little power.

One important factor to remember is that the radio cannot move from standby to fully active instantaneously. There is a latency period associated with "powering up" the radio. So the battery transitions from higher energy states to lower energy states slowly in order to conserve power when not in use while attempting to minimize the latency associated with "powering up" the radio.

The state machine for a typical 3G network radio consists of three energy states:

- **Full power**: Used when a connection is active, allowing the device to transfer data at its highest possible rate.
- **Low power**: An intermediate state that cuts battery power consumption by around 50%.
- **Standby**: The minimal power-consuming state during which no network connection is active.

While the low and standby states drain significantly less battery, they also introduce significant latency to network requests. Returning to full power from the low state takes around 1.5 seconds, and moving from standby to full power can take over 2 seconds.

To minimize latency, the state machine uses a delay to postpone the transition to lower energy states. Figure 1 uses AT&T's timings for a typical 3G radio.

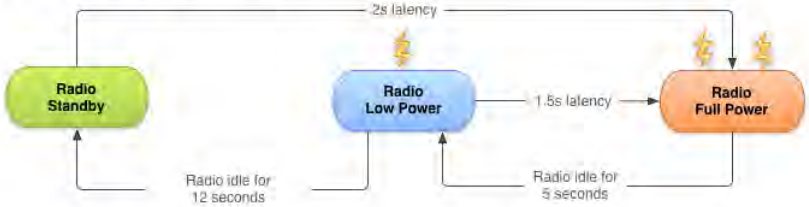


Figure 1. Typical 3G wireless radio state machine.

The radio state machine on each device, particularly the associated transition delay ("tail time") and startup latency, will vary based on the wireless radio technology employed (3G, LTE, 5G, and so on) and is defined and configured by the carrier network over which the device is operating.

This page describes a representative state machine for a typical 3G wireless radio, based on data provided by AT&T. However, the general principles and resulting best practices are applicable for all wireless radio implementations.

This approach is particularly effective for typical mobile web browsing as it prevents unwelcome latency while users browse the web. The relatively low tail-time also ensures that once a browsing session has finished, the radio can move to a lower energy state.

Unfortunately, this approach can lead to inefficient apps on modern smartphone operating systems like Android, where apps run both in the foreground (where latency is important) and in the background (where battery life should be prioritized).

How apps impact the radio state machine

Every time you create a new network connection, the radio transitions to the full power state. In the case of the typical 3G radio state machine described earlier, it will remain at full power for the duration of your transfer—plus an additional 5 seconds of tail time—followed by 12 seconds at the low energy state. So for a typical 3G device, every data transfer session will cause the radio to draw energy for at least 18 seconds.

In practice, this means that an app which makes a one second data transfer, three times a minute, will keep the wireless radio perpetually active, moving it back to high power just as it is entering standby mode.

Figure 2. Relative wireless radio power use for one-second transfer running three times every minute. Figure excludes "power up" latency between runs.

By comparison, if the same app bundled its data transfers, running a single three-second transfer every minute, this would keep the radio in the high-power state for a total of only 20 seconds each minute. This would allow the radio to be on standby for 40 seconds of every minute, resulting in a significant reduction in battery consumption.

Figure 3. Relative wireless radio power use for three second transfers running once every minute.

Optimization techniques

Now that you understand how network access affects battery life, let's talk about a few things that you can do to help reduce battery drain, while also providing a fast and fluid user experience.

Bundle data transfers

As stated in the previous section, bundling your data transfers so that you're transferring more data less often is one of the best ways to improve battery efficiency.

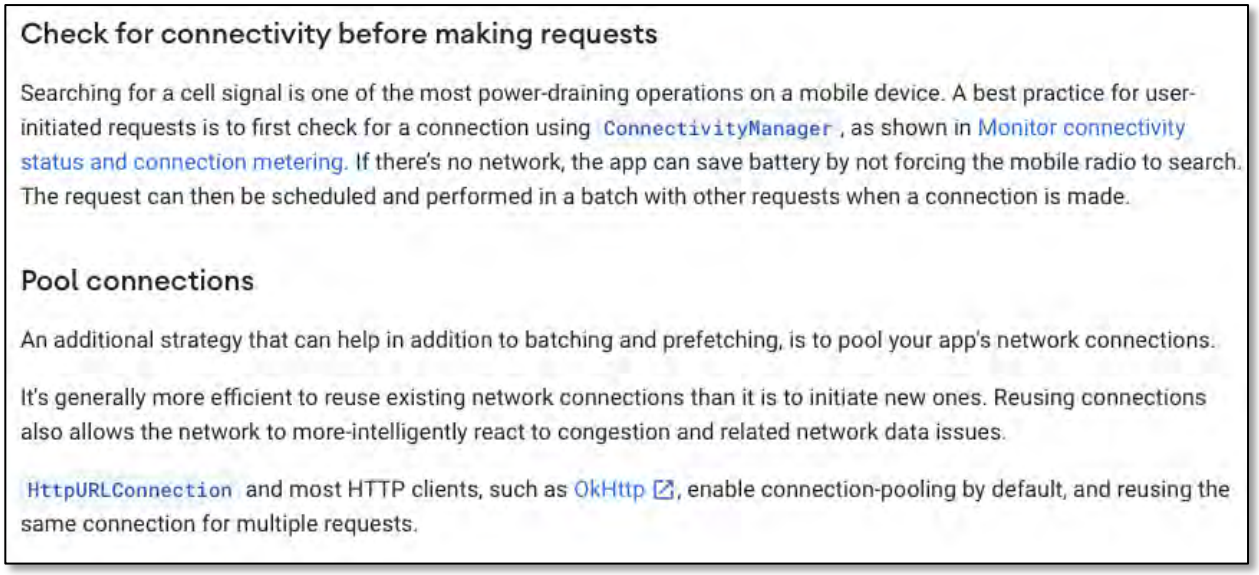
Of course, this is not always possible to do if your app needs to receive or send data immediately in response to a user action. You can mitigate this by anticipating and prefetching data. Other scenarios, such as sending logs or analytics to a server and other, non-urgent, app-initiated data transfers, lend themselves very well to batching and bundling. See Optimizing app-initiated tasks for tips on scheduling background network transfers.

Prefetch data

Prefetching data is another effective way to reduce the number of independent data transfer sessions that your app runs. With prefetching, when the user performs an action in your app, the app anticipates which data will most likely be needed for the next series of user actions and fetches that data in a single burst, over a single connection, at full capacity.

By front-loading your transfers, you reduce the number of radio activations required to download the data. As a result, you not only conserve battery life, but also improve the latency, lower the required bandwidth, and reduce download times.

Prefetching also provides an improved user experience by minimizing in-app latency caused by waiting for downloads to complete before performing an action or viewing data.

Claim	Public Documentation
	 **Check for connectivity before making requests** Searching for a cell signal is one of the most power-draining operations on a mobile device. A best practice for user-initiated requests is to first check for a connection using `ConnectivityManager`, as shown in Monitor connectivity status and connection metering. If there's no network, the app can save battery by not forcing the mobile radio to search. The request can then be scheduled and performed in a batch with other requests when a connection is made. **Pool connections** An additional strategy that can help in addition to batching and prefetching, is to pool your app's network connections. It's generally more efficient to reuse existing network connections than it is to initiate new ones. Reusing connections also allows the network to more-intelligently react to congestion and related network data issues. `HttpURLConnection` and most HTTP clients, such as OkHttp, enable connection-pooling by default, and reusing the same connection for multiple requests.
18. The wireless end-user device of claim 1, wherein the differential traffic control policy defines that the first one or more applications can only access a first one of the network types during particular time windows.	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 1, wherein the differential traffic control policy defines that the first one or more applications can only access a first one of the network types during particular time windows." *See*, for example, the disclosures identified for claim 1.
19. The wireless end-user device of claim 1, wherein the one or more processors are configured to classify that the particular application is interacting with the user in the device user interface foreground based on a state of user interface priority for the application.	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 1, wherein the one or more processors are configured to classify that the particular application is interacting with the user in the device user interface foreground based on a state of user interface priority for the application." *See*, for example, the disclosures identified for claim 1.

Claim	Public Documentation
20. The wireless end-user device of claim 1, wherein the second one or more applications are not subject to a differential network access control that is applicable to the first one or more applications.	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 1, wherein the second one or more applications are not subject to a differential network access control that is applicable to the first one or more applications." *See*, for example, the disclosures identified for claim 1.
21. The wireless end-user device of claim 1, wherein the one or more processors are further configured to classify between: user applications; system applications, utilities, functions, or processes; and operating system application, utilities, functions, or processes.	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 1, wherein the one or more processors are further configured to classify between: user applications; system applications, utilities, functions, or processes; and operating system application, utilities, functions, or processes." *See*, for example, the disclosures identified for claim 1.
22. The wireless end-user device of claim 1, wherein the second one or more applications or services comprises foreground services.	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 1, wherein the second one or more applications or services comprises foreground services." *See*, for example, the disclosures identified for claim 1.
23. The wireless end-user device of claim 1, wherein selectively deny comprises intermittently block when the one or more Internet service activities are requested during selected time windows.	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 1, wherein selectively deny comprises intermittently block when the one or more Internet service activities are requested during selected time windows." *See*, for example, the disclosures identified for claim 1.
24. The wireless end-user device of claim 1, wherein the one or more processors are configured to pre-	The Accused Instrumentalities comprise "[t]he wireless end-user device of claim 1, wherein the one or more processors are configured to prevent the first one or more applications from changing the power state of at least one of the modems, and to not prevent the second one or more applications from changing the power state of the same modem or modems."

Claim	Public Documentation
vent the first one or more applications from changing the power state of at least one of the modems, and to not prevent the second one or more applications from changing the power state of the same modem or modems.	*See*, for example, the disclosures identified for claims 1 and 17.